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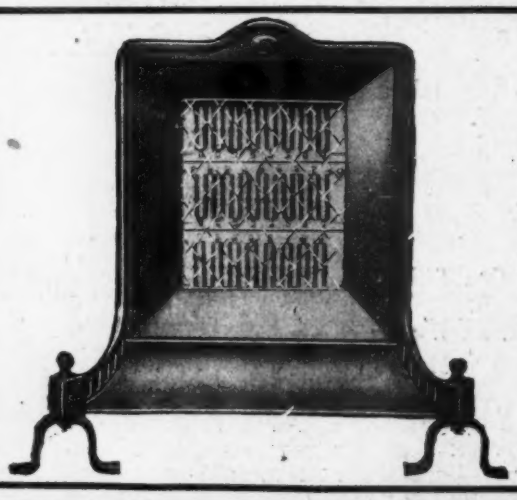

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ELECTRICAL REVIEW.

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ELECTRICAL CONVENTIONS.

WE do not remember any event held in this country during the last four years that could be termed a War Convention of Electrical Men. Of course, there have been innumerable gatherings at which electrical engineers have in groups discussed certain sectional aspects of war problems and activities, or there have been larger meetings in which, more or less casually, general electrical considerations of the times have received attention. As a matter of fact, electrical engineers and commercial men have been fully engaged upon their own piece of work, or, shall we add, seeking an opportunity to get into a position where they can efficiently exercise their specialised training and experience, so that the opportunities for general war conventions have not been numerous. Yet it might not have been a bad idea, had it been possible, from time to time to carry it out without running the risk of offending Dora or conveying information to the enemy, if we could have met from time to time purely to discuss whether our resources of electrica men and intelligence power were being as fully availed of as they could be for the purposes of the war. We do not pretend to believe that such general and efficient use has been made of these resources during the changing course of the war as could be done now by effective organisation and Governmental encouragement if we were just about to begin hostilities. We shall know better how to do things another time!—may we never have to put into practice all the lessons taught us by the war for which we were so unprepared—may there be no "other time," but if there is, well, we shall know better how to proceed and how to be as ready as Herr Rathenau and his august associates, or more so.

We have just been celebrating the first anniversary of the landing of American Forces in France, and as we read the electrical journals that reach us from the States we find ample evidence of our great Ally being "all in" and "with both feet"—as well as, may we add, with both wings—it is so technically as well as in respect of fighting forces. Yet though the whirl of factory life and the tramp of men to camp, flight in the air, and continuous passage of shipping of all kinds through the trackless main, tell of one vast organisation designing and determined to decide the one World issue, electrical men are holding war conventions. At one such held in California from May 6th to 11th, attended by 400 delegates, the American *Electrical Review* says:—"The spirit of patriotic service pervaded the atmosphere . . . and ways and means of marshalling the electrical forces represented, in co-operation with the Government, to prosecute and win the war, were given a dominant place in the addresses, papers, and discussions." The Convention was a joint one of the electrical organisations of the Pacific Coast; the National Electric Light Association, the Electrical Supply Jobbers' Association, and the Californian State

Association of Electrical Contractors and Dealers took part. Our contemporary describes the event as one of the most important of the meetings of U.S. electrical interests held this year, and the foremost result was the "crystallisation of thought and action for meeting war problems." The president struck the right note by a patriotic appeal for the co-operation in effort and singleness of purpose of the electrical industry in war service, which reminds us that though that blessed word "co-operation" has been preached here from the housetops for a long time past, it has been practised sectionally rather than by the industry and profession as a whole, and that at times it has been less impressive than it might have been had co-operation between the Government and the industry been more complete. We have even heard it complained by some who call themselves trade journalists that though they have pressed their suit with fervour the heart of the Government has been as adamant. It may not be that we have so experienced it, for we believe, as we have said before, there are those in the Government who know where to find out what they want to know without appealing to all and sundry. We have been assured, have we not, that it takes two to make a quarrel. We know from experience that it takes more than one to secure co-operation that is worth the having, and, great as may be our ambition in respect to co-operation in the interests of the nation, after all, each must be allowed to decide whether or not his proposed bed-fellow is a desirable person. In the States those in high authority hold modern views in respect to such publicity, and they started it early by securing the co-operation of the right experts connected with the Press. Here, though editors have been taken into confidence, perhaps publicity service has not been one of our best achievements. Perhaps it is not altogether a matter of surprise, for it is not always above suspicion, and may make blunders.

The Californian Convention found little difficulty in following the co-operative lead of the president when he appealed for the co-operation of the electrical industry in war service. Those who followed dealt with such matters as water-power development, fuel conservation, and "a sane policy of informing the public," words which we must accept without quite appreciating their American significance. In the Commercial Section a speaker urged the "acquirement of the national vision instead of the sectional-view point." In the Women's War Service Section (where have we its electrical counterpart here?) the subjects under attention included the need of an open-minded policy in working out the problem of Americanising foreign-born residents. Exactly what this means is not quite clear to us, who, after war-time experiences, are not over anxious to facilitate the naturalisation of aliens within these islands at present, but it is somehow related to the "problem and opportunities arising from the greater employment of women in electrical industry"—a problem concerning which some of our own Ministry of Munitions authorities can teach our Allies much that doubtless they want to know. The Convention held a special War Service Session of the Engineering Section, where the work on conservation and war measures had been carried on by sub-committees in co-operation with State and Federal officials. The topics here considered were:—Possible water-power developments, and their urgent need; the utilisation of Californian power resources, and the quite homely English problem of the joint operation of power companies; the need for securing necessary financial aid for quickly developing additional hydro-electric energy; the interconnection of tranmission systems; how to meet the impending fuel-oil shortage; the urgency of railroad electrification to save fuel oil, of which the railways were the largest consumers; the use of powdered coal and saw-mill refuse; a hundred minor ways of economising in fuel consumption so as to meet the fuel situation of the next year or two. One day's session considered operating problems in the production and transmission of power, with special reference to economical practice, and boiler-room economics was the subject of practical suggestions relating to bonuses for stokers and the larger use of poor-grade coal in powdered form. The mere mention of these headings shows how vast a ground is covered by technical electrical problems in which these 400 war-time representatives were interested In addition to all their joint gatherings, each of the three organisations held their own separate meetings to consider matters of particular concern to their own branches of the industry.

We hope that the time is not far distant when we shall have more electrical co-operative associated conventional meetings in this country than we have had in the past. The Institution of Electrical Engineers is, or ought to be, at the head of us all, and no doubt some worthy convention effort under its auspices may be possible in course of time. It could not be conducive to other than good. It might remove some of the Sectional suspicions and some of the asperities that exist even in these days. When this issue appears in print, the Congress of the Incorporated Municipal Electrical Association will be in progress at Manchester. It meets to consider one great question—electric power supply—we think we might say our *greatest* question, for in it practically all other interests of the electrical industry are interlinked. If ever there was one matter in which there was a need for entire co-operation, surely it is here.

Report on Electrical Trades After the War.

AT last our patience is rewarded, and the complete report of the Electrical Trades Committee, at which we have been permitted to make a few bites from time to time, has now appeared. In view of its importance, we propose to publish it pretty well in full, but the demands upon our space this week prevent us from giving more than the Committee's observations on the national importance of the electrical industry and the recommendations made as a result of the investigation. We shall deal with the several sections in following issues, as it is essential that the whole matter be placed on permanent record in our pages. We trust and believe that the report will have a substantial influence on the framing of national policy respecting electrical industry and trade. The few preliminary "bites" to which we refer above have been very much to our taste, and now that we have the whole dish before us we are gratified to find that they were but representative samples of the most excellent whole. Reform in respect of legislation comes first and foremost in the recommendations, and we have assurance from prominent quarters that such will be introduced before very long. To the proposal that enemy electrical goods should not be imported for three years from the conclusion of Peace, save in exceptional circumstances after 12 months, and then under licence, there will

be few objectors to-day, while we believe that the revelations of the past four years will bring large support to the recommendation that such import duties shall be imposed as will effectively protect the industry. The prevention of enemy dumping of electrical goods will find general favour, as will also the proposals respecting the prevention of enemy control in electrical and allied manufacturing industries and the limiting of enemy ownership of capital in such businesses. To deal satisfactorily with the products of enemy-controlled works in neutral countries will require a very searching and skilful Intelligence Department. It is one of the most difficult, and yet one of the most essential, services that we shall have to provide as part of the machinery for defeating "penetrative" designs. The other proposals are that the British Government and public authorities should show a real preference for British-made electrical manufactures, and use standard types and patterns as far as possible: that the industry should recognise the advantages of combination, and should receive official encouragement to that end; that any transport arrangements shall be such as to assist rather than to handicap industry; that there should be industrial harmony; that better banking facilities should be provided to assist industry; and that Empire resources should be preserved from alien control. Those who have made a prolonged study of the electrical industry and its manifold problems will recognise that the Committee's main conclusions relate to subjects which have cropped up periodically during the last 20 years. We should not allow the occasion to pass without paying a tribute to the patience and diligence with which the members of the Committee carried out their very difficult duties. We are quite sure that if they had had a deciding voice in the matter, the publication of the complete report would not have been delayed for more than a year after they had put the finishing touches to it.

Unity is Strength.

From the reports of meetings which appear elsewhere in our pages, it will be seen that the issue between the established Electrical Power Engineers' Association and the prospective Association of British Electrical Engineers (Electricity Supply Section), as we anticipated, has suddenly come to a head. The "mass meeting" convened by the Institution of Electrical Engineers at Leeds was of a somewhat stormy character; by a large majority an amendment hostile to the proposal before the meeting was adopted, but the chairman refused to proceed to the election of delegates to place the views of the meeting before the mass meeting that is to be held in London, although this was one of the avowed objects for which the meeting was convened. We must confess our inability to follow the reasoning which justified this course; its obvious effect was that the Leeds engineers must either support the official proposal or be deprived of any voice in the proceedings in London, an arbitrary condition which is hardly compatible with the principles of democracy. While we regret the decision arrived at by the Leeds meeting, we cannot deny that there was some justification for it; as we have previously pointed out, the E.P.E.A. has a large membership, and covers the identical ground that is to be tilled by the A.B.E.E., yet the latter apparently has hardly recognised the existence of the former.

Once more we express the earnest hope that these two important movements will be welded together into one strong body, for disunion spells disaster. We are confident that the feat can be accomplished, for the aims of the two Associations are practically identical, and it is perfectly certain that an Association assured of the official support of the Institution will exert a far greater influence than a wholly independent organisation. Fortunately, Mr. Wordingham has come to the rescue, and by the invitation which he has issued to members of the E.P.E.A. to confer with the Council of the Institution, he has opened the way to the attainment of a cordial understanding between the parties, which will, we hope, afford a speedy solution of the present very difficult situation.

British Manufacturing in Australia?

In our opinion British manufacturers should be watching very closely the industrial develvopments that are taking place in Australia. The war has thrown our kinsmen out there upon their own resources. Nowhere is there a stronger determination to dispense with enemy manufactures in the future; but apart altogether from such a consideration, there are several reasons which have directed serious attention to the question of establishing industries in Australia. It is, of course, recognised that the limited population of the Commonwealth can never create such a demand for certain lines of engineering manufactures as to make competitive production a practicable proposal; but there are many of the smaller lines which it is thought can be produced there in sufficient number and at such a price as to justify the putting down of a factory. In certain articles this has been done in recent years, and the prospect of difficulties standing in the way of exportation from this country for some time to come is lending strength to the movement at this moment. One of the factors that is weighing with those interested in the matter is the importance of starting new industries for returning soldiers of the Commonwealth. Telephone instruments are a class of manufacture which have come under discussion and inquiry in this connection. Trained observers of the industrial situation in Australia are urging British manufacturers to study the situation in relation to their own businesses, so that they may be able to decide whether they should start branch factories there. No doubt manufacturers of small, or comparatively small, electrical lines, will find it politic to consider the subject.

Coal Economies in Germany.

The electrical representative of the German Coal Controller discusses (*Elektrotechnische Zeitschrift*, February 21st) methods of reduction in the consumption of electricity, and the consequent saving of coal. A great increase in the consumption of electricity for power purposes has taken place in Germany during the past two or three years. As the output of coal cannot be increased in proportion, in view of labour shortage, the coal supply must be considered as strictly limited. The number of units generated by German stations was respectively 1·5, 5·1, and 10 thousand millions in the years 1909, 1913, and 1917, and the total has increased by more than six times during a period of eight years. While the coal consumption represents but a small proportion of the total consumption of the country, it is still possible to economise considerably in electric generating stations. The proportion of current for lighting to the total output of current has decreased enormously during 25 years, this ratio being 0·8, 0·41, and 0·10 in 1895, 1905, and 1915. It is now only 0·08, which is due to the increase of power requirements. Thus it may be possible to economise coal without affecting power output as distinct from lighting output. A considerable quantity of power is consumed by agricultural operations, and one means of saving is to cut off the supply during certain periods of the night, thus avoiding no-load losses. As regards tramways, certain quantities of energy may be saved by discontinuing suburban services in the large towns and increasing the distances between stopping places.

With reference to current for lighting, greater saving is possible than might at first be anticipated in view of the small proportion of the lighting load to the total load. This is due to the peak loads that are obtained, and any means of smoothing out the peaks will considerably influence coal consumption. Such methods include alterations of working hours, theatre hours, general restriction of lighting, substitution of metal-filament for carbon-filament lamps, &c. The peak could also be reduced by stopping motors at certain hours, restricting the use of lifts at certain periods of the year and times of the day, and by other means. The desired object would also tend to be obtained by curtailing the lighting and heating of tramcars, limiting services, &c.

THE BRITISH MAGNETO INDUSTRY.

The invention and evolution of the magneto has been one of the most important developments of the petrol motor; so much so, that the motor trade is entirely dependent on a regular supply of good magnetos. Yet, prior to the war, this country had not seriously attempted their manufacture. Thanks to the assistance of their Government, the German magneto manufacturers had built up powerful selling organisations in this country, and these, backed by large resources, had been able to prevent the establishment of a British magneto industry on any scale worth recording.

Consequently, the outbreak of war produced a very critical situation. German magnetos were out of the question, and the U.S.A.—the only source of supply—was not in a position to meet the demand either in sufficient quantity or requisite quality. In particular, it could not supply many special types, some of very intricate nature, required by the rapidly expanding flying services. Little doubt is entertained that in subsidising and supporting their magneto manufacturers the German Government recognised the extreme importance of this key industry, and hoped seriously to disorganise our motor transport and air services. Their policy was so far successful that during the early days of the conflict there was a serious shortage of magnetos, and an entire lack of the plant and organisation required for their manufacture. It was, therefore, of vital importance that the manufacture of magnetos should be undertaken in this country, and that no time should be lost in establishing the industry.

Several firms speedily realised this fact, and much of the success which has been attained may be attributed to the formation of the British Ignition Apparatus Association and the opportunity it has afforded for co-operation and interchange of information and views among its members.

There was at the outbreak of war only one British firm making magnetos, and its output was less than 100 machines per week. There was nothing for it but to create a new industry. This was done—in time. But the conditions at the start afforded little prospect of success. To begin with, there was the question of getting the right grade of steel for the magnets—a far more important matter than is apparent. That difficulty was early overcome by the steel makers of Sheffield, and the British magneto is to-day, from that point of view, better than the German. Then there was the "stabilit" used for insulation. That was a much more difficult problem. But this again has been successfully dealt with. In the early days almost every "moulded" part of the magneto had to be carved out of solid vulcanite, but now there is no lack of excellent moulding material. The enamelled wire presented another difficulty; there is about three-quarters of a mile of very fine enamelled wire on the armature of the magneto, and steps had to be taken to secure a supply of this commodity. Finally it was necessary to provide suitable machinery, and to train great numbers of work-people in the art of magneto manufacture. All the difficulties—technical, commercial, and administrative—have now been completely overcome. Ceaseless work in laboratory and workshop has improved the first "best" out of knowledge; new designs have been originated; new methods have been introduced; and now we can claim that there is no magneto that is better than the British for performance and efficiency.

As one of the results of the co-operation alluded to above, all users of British magnetos will enjoy the many advantages which arise from standardisation in production. The complete magnetos are to be interchangeable, not only with one another, but with the best-known pre-war types. Further, many of the essential parts are to be standardised and made interchangeable. Screws, for instance, will be used of standard dimensions; and the different sizes of brushes are being standardised and reduced in number to one-tenth. This means, first, that spare parts will be much cheaper; secondly, that they will be easily and quickly procurable. The advantages of the co-operation are increased by the fact that certain firms are concentrating on particular types.

Between them the members of the B.I.A. Association had up to the end of last year completed over three hundred thousand magnetos, which are being used wherever the fighting services are at work.

It has been stated on good authority that the imports of German magnetos into this country in pre-war days amounted to 200,000 per annum. The B.I.A. Association is now turning out as many as 5,000 machines a week, and it is hoped that this output will be greatly increased in the near future.

Last week we were privileged to make a tour of inspection of the works manufacturing British magnetos. Great interest was afforded by the visit to the Marks & Clerk Laboratory, where scientific research on electric ignition problems has been carried out. Special attention has been given to the study of magnetos and induction coils, and to the ignition phenomena of internal-combustion engines.

The firm of Thomson-Bennett, Ltd., was formed in 1907 to undertake the manufacture of ignition fittings, and for the first few years was mainly engaged upon the production of coil ignition apparatus. The production, in a small way, of magnetos, was commenced in 1909, and was developed outside the motor trade proper, the majority of the machines bring supplied for agricultural, stationary, and marine engines. Thus at the outbreak of war this was the only firm actually manufacturing magnetos in the whole country. The output was small, the weekly average being only about 25. In the autumn of 1914, arrangements were entered into with Joseph Lucas, Ltd., and the present company, Thomson-Bennett Magnetos, Ltd., was the outcome. The present works were specially erected and equipped, and the staff moved into their new home a little over 12 months ago. Since the reorganisation very nearly 100,000 magnetos have been produced for all classes of work. The weekly output of this firm is already very large, and it is hoped practically to double it by the end of the year.

It has been necessary so far to continue the manufacture of a fairly large number of types, as a number of these could not be obtained elsewhere. In future, attention will be concentrated on a smaller programme to ensure quantity production on the most economical basis possible.

The branch of the organisation of the British Thomson-Houston Co., Ltd., which is now entirely used as a magneto factory, undertook before the war the manufacture of electrical meters and instruments of precision. It was, therefore, in a unique position to undertake the manufacture of magnetos. In the early days, before Government contracts were placed with the company for magnetos, they started to build cycle and car magnetos, and many thousands were delivered. Special attention was given to a particular type, and all the energies of the organisation were absorbed by the task of establishing the manufacture of high-speed magnetos on a thoroughly reliable basis. Several new designs were developed and tested, and, as a result of the experimental and research work that has been carried out, the company is now building a four-spark polar induction magneto that is a vast improvement upon anything manufactured by the Bosch company, this having been developed on quite different lines to the type of magneto familiar to motorists.

So rapidly did the small business of Messrs. Morris and Lister, Ltd., progress that, early in 1915, the works, staff, plant—everything, in fact, became utterly inadequate for the contracts on hand. A separate company was formed, under the name of the M.-L. Magneto Syndicate, Ltd., and large works were found which were suitable for its requirements. "Seeing is believing," and the works prove in no uncertain manner the firm's progress. They form, indeed, a powerful testimony to the energetic manner in which a difficult situation has been faced and conquered.

The firm of Messrs. North & Sons, Ltd., had the advantage of experience in the manufacture of speedometers, which have many features in common with magnetos, so that it was not a difficult matter for it to take up the new line. Its works have been specially designed for the purpose, and employ over 1,000 hands; moreover, they are entirely self-contained, producing all their own castings,

forgings, and insulating materials, and possess an admirable equipment of automatic and semi-automatic machine tools, which enable them to turn out accurately finished parts at a minimum cost.

The staff is highly trained, and provided with the most up-to-date appliances, which enable interchangeable parts of the highest quality to be produced. Numerous ingenious devices have been adopted to facilitate rapid production, combined with certainty in attaining the desired result, and some remarkable examples of hot-pressed work in brass form an interesting feature of the magneto work, while the employment of the stroboscopic method for the quick and accurate calibration of speedometers deserves special mention.

The members of the B.I.A. Association having manufactured in large quantities magnetos of every description, which have given thoroughly reliable results in practice, we have no hesitation in saying that when hostilities cease they will be in a position to place new designs of magnetos on the market which will be better in all respects than those manufactured in Germany. Further, they will be produced in such ample numbers that the demands of the motor and allied industries after the war will be fully met, as regards both quantity and quality.

THE ELECTRICAL TRADES AFTER THE WAR.

Report of the Departmental Committee.

We begin below a reprint of the report (Cd. 9072, 2d. net.) of the Departmental Committee appointed by the Board of Trade to consider the position of the electrical trades after the war. The report is dated April 18th, 1917, and is signed by:—Sir C. A. Parsons (chairman), Mr. J. Annan Bryce, Sir T. O. Callender, Mr. James Devonshire, Mr. B. M. Drake, and Sir John Snell. The Committee records its appreciation of the valuable services rendered by the secretary, Mr. J. F. Ronca. As it is impossible to give the entire report in a single issue, we turn to the end of the document first, in order to give the Committee's summary of recommendations. These are as follows:—

1. A thorough reform of the legislation and conditions under which the generation and distribution of electricity are promoted and administered in this country which will involve modifications in the relevant Acts and Regulations; and a like reform of the legislation and conditions affecting the promotion, construction, and operation of tramways and light railways.
2. The prohibition of import of enemy goods for a period of three years after the conclusion of Peace, subject to the importation under licence in special circumstances after the expiration of the first 12 months.
3. The imposition of import duties sufficiently high to protect effectively the electrical industry.
4. The prevention of the sale in the United Kingdom of any imported electrical goods at prices lower than those current in the country of origin.
5. The recognition of the advantage of combination among manufacturers and official co-operation with such action.
6. The prevention of any concern engaged in the electrical or allied manufacturing industries, if controlled directly or indirectly by enemy capital, from continuing to trade within the Empire, unless it be specially authorised and its constitution made public, and the passing of legislation requiring that not more than 25 per centum of the capital in any other electrical or allied undertakings shall be held either directly or indirectly by enemy subscribers or their agents.
7. The treatment as enemy products of all goods produced in foreign countries by concerns controlled by enemy capital or under enemy direction.
8. The exclusive acceptance of British tenders by State Departments, public bodies, and companies supplying electrical energy under statutory powers.
9. The adoption by Government Departments and public authorities so far as is practicable, of standard types and patterns of plant and apparatus.
10. The prohibition of transport discriminations operating to the detriment of British manufacturers, and the provision of improved transport and cargo handling facilities.
11. The promotion of a better understanding between employers and employed, and the provision of better housing and working conditions.
12. The provision of extended banking facilities, preferably by the establishment of industrial banks, to enable British manufacturers to secure and finance contracts and engineering enterprises.
13. The recognition of the permanent and ever-increasing importance to the Empire of the natural sources of power for the generation of electricity in the British Dominions, and the introduction of safeguards by legislation or otherwise to prevent these national assets from passing into alien hands or under alien control.

Certain further recommendations will be made in a supplementary report dealing, *inter alia*, with education, research, the decimal system, and the consular service.

The Committee was appointed to consider the position of the electrical trades after the war, with especial relation to international competition, and to report what measures, if any, are necessary or desirable, in order to safeguard that position. Evidence was given by the I.E.E., the I.M.E.A., the Association of Electric Power Companies, the B.E.A.M.A., the Cable-Makers' Association, the Tramways and Light Railways Association, eminent consulting engineers, manufacturers of machinery, cables, and other electrical appliances, directors and engineers of important electric supply undertakings, by bankers, and many others.

The national importance of the electrical industry is first reviewed, and thereafter the report is divided into several sections:—

1. Electricity generation and transmission in the United Kingdom.
2. Electric traction in the United Kingdom.
3. Manufacturing.
4. Financial interdependence between manufacture and finance.
5. Imperial control of sources of electrical energy.
6. Summary of Recommendations (reprinted above).

There are two appendixes; one deals with measures against enemy trade to be adopted on the conclusion of Peace (this is dated October 11th, 1916), and one on banking and finance (dated July 20th, 1916).

The reference to the National importance of the electrial industry reads as follows:—

3. The Committee is of opinion that it is impossible to give proper consideration to the future of the electrical trades without studying the position of the electrical industry as a whole. The national importance of this industry has never been realised either by Government or by the general public, and as a consequence both the industry and the country have suffered from legislative errors.

4. Through the efforts of Faraday, Wheatstone, Kelvin, Swan, Hopkinson, and many others, Great Britain was, and should have continued, first in electrical enterprise. The nation's pre-eminence in all branches of engineering provided a foundation upon which the new and closely allied electrical industry might have been naturally and quickly built up. Mines and factories were so situated as to gain rapid advantage from the application of electrical science, and railways, especially the urban and suburban lines, were, owing to density of population, ideally suited to electrification. In order, however, to bring electrical energy into practical use it was necessary to employ cables, either underground or overhead, the installation of which involved interference with streets, roads, and private lands. Manufacturers of electrical plant have been held back while Parliament and local authorities debated how the distribution and use of electricity might be prevented from infringing conventional conceptions of public privileges and vested interests. Hence the progress of the industry has throughout been hampered by political considerations. While America, Germany, and other countries were eagerly seizing the benefits of electricity, our authorities were busied with the erection of obstacles to its development. Thus for years this country stood still, leaving the field open for foreign manufacturers to gain, both in their own and other markets, a hold which they have never lost. Abroad there were strong encouragements, in Great Britain irksome restrictions, and the evil effects on the British electrical industry justly entitle it now to special remedial measures, which can be secured only by legislation. Such legislation should be passed without delay.

5. The early history of motor traction on highways is an analogous instance of legislation which proved disastrous. Mechanically-propelled vehicles were successfully adopted in this country early in the 19th century, but prejudice and the horse interest succeeded in inducing Parliament to pass restrictive legislation which, by limiting speed to four miles an hour, practically destroyed the industry. As a result the manufacture of motor cars in Great Britain was for many years, and in some respects still is, behind that of other countries.

6. The prosperity of our industries depends largely on cheap energy for driving machinery, and even a fractional reduction in price is of importance in determining the ability of manufacturers to compete in the world's markets. The appli-

cation of electricity to agricultural purposes is also claiming attention, and will, without doubt, extend.

7. The scientific replanning of our distribution of energy would effect a saving of no less than 50 million tons of coal per annum. Till lately coal has been so cheap that its conservation has been neglected, but it must be strictly economised in the future if the maximum return from this irreplaceable national asset is to be realised. This replanning would also reduce the cost of power for manufacturing, for the lighting of streets and houses, for the propulsion of railway, tramway, and road vehicles, and at the same time greatly promote social and domestic convenience as well as general improvement in public health.

8. Witnesses of high authority estimate the loss incurred by the nation through failure to take full advantage of electrical progress at not less than £100,000,000 a year, a loss preventable by concentrating generation under improved administration.

9. The density of her industrial population over wide areas, the length of her seaboard, and its proximity to manufacturing centres, the richness of her coal supplies, the advantage furnished by her climate to textile manufactures, the effect on her markets of the close connection with the Overseas Dominions—all combine to make Great Britain the most favourably situated country in the world to derive the fullest benefit from the use of electrical power.

10. The value to this country of the electrical manufacturing trade has not been sufficiently realised. The volume of this trade already amounts to 22½ millions sterling a year. Considerable as these figures are, they represent only a fraction of the trade which can be obtained if the blunders of the past be rectified. A world trade exists, and Great Britain must have her proper share. In no branch of engineering will technical proficiency and mechanical skill find better recompense than in electrical manufacturing, and none deserves more consideration by the State.

11. It is not too much to say that the war has demonstrated the safety of the Empire to be dependent on the employment of electricity. The output of munitions in the great industrial areas could not possibly have attained anything like its present scale had not an enormous aggregate horse-power of electrical energy been available for the supply of power and light. The emergency has proved the electrical industry to be a "*key industry.*"

(To be continued.)

THE ASSOCIATION OF BRITISH ELECTRICAL ENGINEERS (ELECTRICITY SUPPLY SECTION).

A meeting under the auspices of the Western Local Section of the Institution of Electrical Engineers was held at Bristol, on Friday last, in connection with the formation of a branch of the above Society.

The President-Elect of the Western Local Section, Mr. H. I. Rogers, presided over a representative audience. In introducing Mr. H. Faraday Proctor, he remarked on the advantages of unity, and expressed the hope that all the various societies at present being formed would be absorbed in one central body.

Mr. H. Faraday Proctor explained the objects of the meeting, and said the proposed association was intended to embrace all existing associations in order that there might be one association only. The Council of the I.E.E. had decided that the new association could be registered as a trade union if the members thought fit. The reason why the proposed association was being formed under the auspices of the Institution was solely the fact that the conference of the various associations held on February 7th felt that the Institution, as premier body, should take the initial steps. It was most important that a large numerical representation should be secured to the Association in order that its weight might be felt. With regard to linking-up with other similar associations, he read a resolution of the National Executive of the Electrical Power Engineers' Association held in Birmingham on June 1st:—"That this National Executive Council of the E.P.E.A. desire the co-operation and final linking-up of all technical engineers engaged in the electricity industry." That was just what they wanted. The desirability of combination was emphasised in the Whitley Reports, which advocated the formation of National Councils for every industry, and in addition to the National Councils there would be local district councils, also works committees. The reports specified that these councils should only be formed in connection with industries that were properly organised. The workmen had their unions, the employers had their federations, the municipalities had the Incorporated Municipal Electrical Association, and the companies likewise had their associations. Station engineers were not organised; it was very necessary therefore that a representative association of such gentlemen should be formed at once. At Cardiff on the previous day the point was raised whether chief engineers should belong to this association. He thought the chief engineers ought to be there to assist their respective staffs. It would be advantageous for every engineer to be in it. It would not do for master and man to be in the same association, which would be the case if the Electrical Trades Union secured any of them as its members. Another point raised was as to the necessity of this new association, as there were plenty already in existence. There were several of them, but there was no one representing the whole, and he thought it was very necessary that this association should be formed, and final amalgamation effected. It was decided at Cardiff that there was no objection to heads of departments and chief engineers being included; a resolution was passed in favour of forming the association, and a delegate was appointed to attend the mass meeting in London.

The Chairman read the names of a number of gentlemen who, though unable to be present at the meeting, expressed their hearty support of the movement, and said there was no possible doubt that both sides of every industry would have to form themselves into associations in order to get their proper positions on the National Councils that were about to be set up for each industry. It was most essential that one very strong body should be formed, and it was a very good thing that the I.E.E. as a senior body in the electrical industry should have promoted the organisation of the new association. In a recent issue of the *Board of Trade Journal* he noticed that Germany was inaugurating, as one of her post-war projects, Chambers of Labour, and it was significant that a separate chamber was to be organised for salaried officials.

Mr. J. W. Bache (Cheltenham) asked whether this association would be an association of associations, or an amalgamation of others with similar objects. He assumed that the particular directions in which the thought of the society would be directed would be terms of engagement, security of tenure, adequate salaries, and possible superannuation. The status of the profession would be raised were it a *sine qua non* that important appointments to municipal or company posts should be given to members of the I.E.E.

A discussion followed, and Mr. H. Faraday Proctor said he thought they were taking the wisest course by allowing this association to be formed under the auspices of the I.E.E. It would be well if some of the other societies were to approach the larger institutions and get them to make a move. If they got the professional institution to give them their blessing and backing, who was there to say anything against them? He suggested that this association, if formed, should be a sub-section of a larger section representing all electrical engineers, and that the electrical engineers should be a section of a larger body embracing all engineers, the executive being a council, grand council, and, if they chose, a supergrand council. Until this organisation was effected, the connecting link was almost missing. Eligibility for membership was the only matter on which he experienced difficulty in speaking. Of course, the Council, and particularly the President, of the I.E.E. were very anxious to push the Institution. The suggested qualifications for membership were as follows:—

Members.—Members shall be engaged in the business of electricity supply, and shall be corporate members of the I.E.E.

Associate Members.—Associate members shall be persons of good general education engaged in the business of electricity supply, and they shall have had at least one year's training at an approved technical college, or two years' training at an approved firm, company, or corporation, or shall have been engaged in electricity supply in a responsible technical position for at least three years.

The full member of this association would be a corporate member of the I.E.E. There was certainly something to be said for that. They wished to raise the status of their profession. He thought the only way in which that could be done was for the Institution to get a Royal Charter, so that membership of the different classes might give the same legal status to an engineer to call himself an engineer and to practise, as in the medical and legal professions, where only by membership of the Law Society and the British Medical Association was a man entitled to call himself a lawyer or a doctor. Whether or no senior membership of this association should necessitate membership of the I.E.E. was a matter for the mass meeting. The new association would be entirely distinct from the I.E.E.—it was to have its own council. It was only suggested that membership should be dependent upon membership of the Institution. Mr. Bache had touched upon the objects very successfully. The association would do well to leave the question of status to the Institution. As regarded the question of amalgamation, he certainly agreed that there should ultimately be only one association, and that they should all come in under one banner.

It was resolved that an association should be formed in accordance with the circular sent out, and that Mr. W. J. Bache should be the delegate to the mass meeting to be held in London.

A mass meeting of engineers engaged in the business of electricity supply, convened by the Yorkshire Local Section of the Institution of Electrical Engineers, was held at Leeds on Friday last, to consider the advisability of establishing an Association of British Electrical Engineers engaged in

electricity supply. The following is an abstract of a full report supplied to us by a number of those present:—

Mr. W. Lang, Chairman of the Yorkshire Section of the I.E.E., was elected to the chair, and there was a large attendance. The Chairman called upon Mr. W. B. Woodhouse to explain the matter to the meeting.

Mr. W. B. Woodhouse said he had come there at the request of the Council of the Institution of Electrical Engineers to address them on a matter which the Council felt to be of very great importance to all of them. The Whitley Committee's proposals had received the approval of the Government, and the Ministry of Labour was actively engaged in assisting in the formation of industrial councils, of which it was proposed to set up one for the electricity supply industry. The industrial council was a body composed of associations representing on one side the employers, and on the other side the employés. The employers were being organised, and that meeting was not concerned with them. The operative workmen were being organised through their trade unions. The class of engineers who were responsible for the management and executive duties were not fully organised. The position of that class of men was a rather special one; they were for the most part the employers' representatives in relationship to the workmen generally, as well as occupying their own special position in their individual capacity as employés. Because their position was such a special one, it was felt that an association to represent their interests was necessary. They should be regarded as belonging to a profession as honourable and distinguished as that of doctors, dentists, and accountants, and ought to be able to close the door to the unqualified man, so that on man should practise as an electrical engineer unless he had been properly trained and was a recognised member of the associations which included all the properly trained men of the country. The first step to the attainment of that object was to form an association in which all well-trained men at present engaged in the profession of electrical engineering should be included, and then to lay it down that in future they would not take any man into the association unless he was well trained. He would be told, no doubt, that there were already associations in existence with these objects in view, and that another association was not necessary. He thought it was necessary that, whatever organisations existed at present, they should all be brought into one association. If that was agreed to, the next point to be settled was the dividing line between the supervising engineer and the operative engineer, who might be called the mechanic. The test dividing these two classes should, he thought, be an engineering one, and one which would be recognised by outside bodies. The Council of the Institution thought that the existing qualification of membership of the Institution might well be used to divide the executive engineer from the working engineer. It was suggested for discussion that if they had some outside qualification, such as the Institution had suggested, they would be in a much stronger position than if they set up a qualification in their own existing associations, not one of which covered the whole of the country, in regard to which, with all due respect for what had been done, none of them was sufficiently influential for the Government departments or the public generally to say that their test must be recognised throughout the country. They wanted an organisation which would ensure for its members, as well trained and fully qualified men, adequate pay, satisfactory conditions of employment, and the social standing to which their qualifications entitled them. That could only be done if they got every engineer in the industry to join. The I.E.E. had already very nearly 7,000 members. Perhaps the I.E.E. did not sufficiently advertise what it was doing, but nevertheless it was taking an active part in matters affecting the industry, and the Council were particularly concerned to sustain and improve the status of the members, and to help their interests. The Council had, therefore, discussed this matter with a provisional committee representing the Incorporated Municipal Electrical Association, the Electrical Power Engineers' Association, the Chief Technical Assistants' Association, and the Associated Municipal Engineers of Greater London, and with these representatives it had been agreed that something ought to be done, and that the I.E.E. might take an active part in doing it. Therefore the Institution had organised meetings throughout the country through the agency of Local Sections. Meetings had been held at Newcastle and Glasgow, at both of which it had been decided to appoint delegates to attend a meeting which it was proposed to hold in London, where a final decision could be taken in consultation with representatives from all parts of the country. He moved:—"That this meeting of electrical supply engineers of Yorkshire, promoted by the Yorkshire Section of the I.E.E., supports the formation of an association of British Electrical Engineers, and appoints delegates to represent it at the mass meeting to be held in London under the chairmanship of the President of the I.E.E."

Mr. Campion seconded the resolution.

Mr. Lunn (Manchester), speaking as Northern Division President of the E.P.E.A. and an Associate Member of the I.E.E., said that he wanted particularly to bring home the fact that in regard to the present matter the E.P.E.A., which had been doing such great work during the last six months, was being ignored, as if it did not exist. That Association had covered practically the whole ground that Mr. Woodhouse had mentioned. He believed he was backed up by the whole of the members of the E.P.E.A., numbering over 1,000, in making his protest against the present line of conduct of the I.E.E. The electrical engineers waited years to see what the I.E.E. would do, and it had done nothing, and now, when they had started themselves and had just nicely got going, they found that the ground was being covered again, and the E.P.E.A. was treated as if it did not exist. Yet the E.P.E.A. included many chief engineers and deputy chief engineers and assistants, and in the Northern Division alone—particularly within 20 or 30 miles of Leeds—had a membership of over 400 qualified engineers. Not a man had been admitted into the Association unless he had the qualifications. He was not antagonistic in any way towards the I.E.E., but he felt that the supply engineers did not want fathering in this matter by the I.E.E. They could not understand a protective organisation starting from the top. They felt that it should certainly start from the bottom. They needed an organisation which was going to define the line between the brain worker and the manual worker. They had seen the manual worker receiving magnificent rewards in many cases, whilst the brain worker—the supervising worker, as Mr. Woodhouse had called him—had been receiving nothing. That was one reason why they had started; and they had gone on gradually building up and up on the lines indicated in the statement of objects and constitution of the E.P.E.A., which he read in full. The E.P.E.A. should, he thought, certainly claim priority over the A.B.E.E.

Mr. Webber (Keighley) said he thought that though the E.P.E.A. was a very useful institution, it did not include the bulk of the chief men of the profession, and never would do so; further, the Institution had a status that no association which had been formed recently could have, and, in his opinion, if they were going to have any success in getting the same grade as doctors and the legal profession, and so forth, it must come through a national institution like the I.E.E.

Mr. P. Furness (Dewsbury) read a report on the proceedings of the West Yorkshire Section of the E.P.E.A. since its formation, and stated that the membership of the section totalled 110. A sub-committee had been formed to see that the Association was properly represented on the Whitley Council. The Association was to be represented at a meeting convened by the Ministry of Labour, to be held in Manchester on June 19th, for the purpose of putting into operation the Whitley Report, and if it had not been for the action of that Association there would not have been any representation of the skilled technical staffs of electricity supply undertakings at that meeting.

Mr. W. A. A. Burgess (Huddersfield) said he welcomed Mr. Woodhouse's statement that the proposed new association was aiming at unity. He thought that all the existing associations, with the exception of the E.P.E.A., had expressed their willingness to be members of branches of any new association which was formed with a similar object. He did not think, however, that the association proposed by Mr. Woodhouse was sufficiently broad in its basis. It should include all electrical engineers, and be country-wide.

Mr. J. E. Ellis (Morley) said it appeared to him that there was a flood of new associations and societies springing up professing to have objects which were almost as bewildering in variety as the war news was. These associations were formed on all sorts of lines, but there was only one which was formed on business lines, and for that reason had taken firm root hold. That was the E.P.E.A., of the local section of which he was the chairman. From the scientific point of view, the Institution had served its purpose remarkably well, but it had failed to bring itself into line with the democratic feelings of the majority of its junior members, and had done absolutely nothing towards improving the conditions of their employment and bringing these up to date and in line with the present-day conditions. Wages were in many instances miserably low for the responsibilities borne and the services rendered by a large number of the junior members, notwithstanding the fact that the chiefs of these juniors were mostly the leading men of the Institution. Therefore, could they wonder if these members were dissatisfied with what the Institution had done for them—or, rather, what it had not done—and that they should combine and form separate associations of their own? He failed to see why the meeting should give the Institution a mandate to try and accomplish something that it had proved so utterly incapable of doing.

Mr. W. F. Mylan (Sheffield) said that he wished to draw attention to the danger arising from the multiplicity of associations, and to suggest that delegates should be appointed from the meeting to consider the advisability of either forming a new association, or recommending the members to join one of the associations which were already existing or in course of formation. For many years he considered the Institution had done very little to further the progress of the engineer, and he very much doubted whether it would be right under the circumstances to proceed with a new association which was going to be fathered by the Institution, although that body had done very good work as a scientific and academic society. In order that the meeting might appreciate what the feeling was on the manufacturing side, he read a telegram which had been sent to him stating that representatives of the employés of a number of large firms, including B.T.H., Siemens, Ferranti, Brush, Reyrolle, Electrical Apparatus, and Westinghouse, strongly disapproved of a trade union formed under the supervision of the Institution of Electrical Engineers, and declaring that as effective control

by the members was essential for a healthy organisation, it would be better to consider the possibility of independent action by all classes of engineers.

Mr. R. C. Atkinson (Leeds) said the last speaker had touched the crux of the whole matter. He thought that if they would look at the rules drafted by the Committee of the West Yorkshire Section of the E.P.E.A., they would agree that those who had drawn up the rules had been fully alive to the wider issues that were at stake in the matter, and also to Mr. Mylan's point about the necessity of any protective association being under the control of those whom it wanted to protect, not under the control of those whom the members had got to be protected against. The E.P.E.A. had been in existence for a considerable time, and had been doing good work. The Northern Division had had a committee in consultation with the Chief Engineers' Association of Lancashire and Cheshire, and had been complimented by the chief engineers upon the fact of having arrived at a basis on the salaries question, which was acceptable to all parties. A good deal of use had been made by the Institution of Mr. Bostell's name (Chairman of the E.P.E.A.), and he thought this was without warrant altogether. Mr. Bostell had an invitation to attend a meeting in his personal capacity, and they had been trying to say ever since that he was representing officially the E.P.E.A. at that meeting. It was claimed on the strength of that, that Mr. Wordingham was conferring with the officials of the E.P.E.A. with a view to incorporating that enterprise with the work of the Committee which Mr. Robinson represented. It seemed to him that that was stretching the long bow very considerably. The I.M.E.A. in the spring of this year passed a resolution determining upon joint action with a view to stopping the "objectionable practice" of "technical assistants engaged in electrical undertakings being induced to accept other positions." That, apparently, was their idea of protecting the interests of the staff, and these were the gentlemen who were asking the staffs to join their association to protect their interests. The E.P.E.A. had got a statement in one of their objects in the rules to cover that, because they maintained that that was one of the liberties of the subject. As to chief engineers joining the E.P.E.A., they quite agreed to that, provided that those gentlemen were qualified. He proposed the following amendment:—"That this mass meeting of Yorkshire electrical engineers, called by the Council of the I.E.E. to support the proposed A.B.E.E., is not satisfied that this new association is being formed in the interests of the majority of the profession, as apparently the majority of those who have promoted it are senior members, and some have, so recently as three months ago, been associated with reactionary policies directly antagonistic to the legitimate interests of the junior members of the profession who compose by far the majority of it; also, bearing in mind the foregoing, and the fact that in the past the Council of the I.E.E. has done nothing in the interests of the lower grades of the profession, and that there are already in existence two strong associations, the E.P.E.A. and the B.E.A.T.A., the former covering the power-supply section and the latter the manufacturing section of the industry, who have been actively at work for many months past, and have already achieved a considerable measure of success with benefit to their members, who include all grades of qualified engineers, this meeting strongly disapproves of the action of the Council of the I.E.E. in fostering the proposed A.B.E.E., instead of the existing association, and is not prepared to endorse their action or support the proposed new association; and hereby (1) instructs the delegates to be appointed later at this meeting to attend any further meeting or conference in London or elsewhere to represent this meeting, and to make known its views; and (2) the secretary of this meeting to publish in the technical Press a full and unedited report of this meeting. Finally, this meeting pledges itself to support the E.P.E.A. and the B.E.A.T.A."

Mr. Howard Brown (Bradford) said he would like to know whether, if the proposed new association was formed, the officials of it would be the Council of the Institution, or if it would be controlled or governed by persons elected by the members themselves. It was very desirable that there should only be one organisation to be able to speak in this connection for the whole of the electrical industry, and that that association should include on the one hand chief engineers of the great cities and towns, and on the other hand sub-station engineers. If a new association was formed it should be controlled by persons elected by the members.

Mr. S. Simpson (Bradford) said that he had made inquiries as to whether the Institution had approached the E.P.E.A. to find out particulars concerning it. He gathered that the secretary had never been approached, and the association had been ignored. The E.P.E.A. had been formed with democratic purposes, and he wanted it to remain democratic. From information which he had from the President of the B.E.A.T.A., which covered the manufacturing side, he found that there was the fullest harmony between the two associations, which were working on parallel lines. He was convinced that the E.P.E.A. was working on the right lines, and only needed the unanimous support of electrical engineers throughout the country.

Mr. Campion (Dewsbury) said that by its constitution the Institution was debarred from taking any action of a political character. He asked for loyalty to the Institution at a time when men were working under a good deal of strain. It would be the very worst thing they could possibly do if they turned down the resolution. The whole idea was to get representation before anything was done under the Whitley Report.

Mr. Woodhouse, in reply, said the discussion seemed to have turned almost wholly on the very popular cry that the Institution was no good. The cause of the supposed offending of the I.E.E. in the present instance appeared to be that they had not sufficiently recognised, or, at any rate, not fully conveyed their recognition, of the very valuable work done by the E.P.E.A. The Institution did, in fact, appreciate how good that work was, but there were other organisations which had also done good work, and it would be invidious of the I.E.E. to pick out one of the existing associations and say that it represented the whole industry, because it was certain that no existing association could claim that. Therefore, the London meeting would settle who should represent the whole electricity supply industry. The people who were going to manage the new association were the members of that association, and it had never been intended that the Institution should take any direct hand in the management. It was proposed that an entirely separate organisation should be formed, the rules and regulations of which should be drawn up by those who became members of it. He had no doubt that the very excellent rules which Mr. Lunn had read out would be a good starting point. The people at the London meeting would choose their own officials, and run their own society throughout. He sincerely hoped that they would not say that, because the merits of one association or another had not been fully recognised, they would not go to the meeting in London and discuss the formation of a national association.

The Chairman said they had before them a resolution proposed by the Institution, and the meeting had been convened by the Institution, who had paid the expenses of it. There was also an amendment, and he wished to make it quite plain that if they refused to pass the resolution it meant that they refused to take advantage of the opportunity which the Institution had offered to them of sending delegates to attend the meeting in London. If, on the other hand, they decided to accept the invitation, they would choose the delegates themselves, of course.

Mr. Atkinson pointed out that his amendment, like the resolution, also provided for the sending of delegates to London.

The Chairman said if delegates were sent by instruction of the amendment they would not have the invitation of the Institution.

Mr. Atkinson: They would be the delegates of the meeting.

The point was discussed at some length.

The amendment was then put to the meeting and declared by the Chairman to be carried by 66 votes to 28.

The Chairman: I think that terminates the meeting.

Mr. Atkinson: There are delegates to be appointed, Mr. Chairman.

The chairman left the chair, and the meeting terminated.

A similar mass meeting was held at Birmingham on Monday last; the official resolution was passed, and delegates were appointed. A report will appear in our next issue.

THE ELECTRICAL POWER ENGINEERS' ASSOCIATION.

A meeting of the Electrical Power Engineers' Association (Southern Division) was held on Monday evening at St. Bride's Institute, Fleet Street, E.C. Mr. C. H. Wordingham, President I.E.E., was in the chair. There were over 200 engineers present.

A paper was read by Mr. A. C. Bostel on "Trade Union Registration and Societies Incorporated," in which he traced the history of the growth of combinations of workers and employers, and pointed out the differences between the legal status of registration and that of incorporation. The paper had been written for the combined purpose of explaining the reasons which had weighed with the National Executive Council of the E.P.E.A. in deciding upon registration, and of demonstrating to those engineers who had objected to join the E.P.E.A., because of that decision, that under the existing State arrangements for Industrial Councils membership of a trade union became essential. Meanwhile the Institution of Electrical Engineers had removed the stigma that previously attached to a corporate member who was also a trade unionist, and it had been decided that the proposed Association of British Electrical Engineers should be registered as a trade union. The address of Mr. Bostel therefore lost somewhat in topical value, but retained much of historical interest.

Mr. Wordingham, who had a most cordial reception, complimented Mr. Bostel on his able address, and took the opportunity of explaining the action of the I.E.E. in endeavouring to promote an all-inclusive Association of Engineers engaged in the electrical industry. The Council of the Institution had discussed the necessity for such an association for some considerable time, in view of the fact that they were in the transition stage between pre-war and post-war conditions, and thought that in regard to the important question of the re-

construction of the electrical industry the Institution, as the acknowledged premier corporate body of the profession of electrical engineers, with a membership approximating to 7,000, including all engineers who had attained eminence in the profession, was naturally responsible for taking the initiative. The Council had already formulated a scheme when it was approached by a committee which was understood to be representative, although unofficially, of the various existing sectional associations: the I.M.E.A., the Conference of Company Chief Officials, the C.T.A.A., and the E.P.E.A., Mr. Bostel, the president of the last-named, being a member of that committee. On the committee's representations the Council of the I.E.E. decided to drop its original plans and give the weight of its influence to the scheme formulated by this committee, which it accepted as covering all grades of qualified engineers engaged in electricity supply. The Council of the I.E.E. was entirely unselfish in this matter, and had only the single-minded desire to raise and maintain the status of the electrical engineer, and obtain recognition for him on any body formed by the State in the scheme of reconstruction. It was thought that the Institution, with its large membership, was an existing power which it would be folly not to make the utmost use of in any movement for the material and other advantage of all qualified engineers from chief to junior engaged in electricity supply. To collate and consolidate the views of the existing sectional associations, mass meetings had been held under the auspices of the Local Sections of the I.E.E. at their various centres, and at West Yorkshire, to his surprise and regret, there had been hostility on the part of the members of the E.P.E.A. Unity was essential, and he hoped that night to hear the views of this Association, so that a step forward might be made in levelling the evident differences of opinion existing.

Mr. LAW, on behalf of the Southern Division of the E.P.E.A., said they accepted Mr. Wordingham's presence that night as a happy augury of the future good relationship between the premier Institution of the profession and the Electrical Power Engineers' Association. No one could doubt the sincerity of the President of the I.E.E., and all were agreed that an association such as was contemplated was necessary. The E.P.E.A. held that such an association already existed. Their Association was by no means sectional, but was representative of electricity supply engineers, both company, municipal, and those engaged on power plants, and also engineers engaged with manufacturers. They had been invited to send representatives to the first meeting summoned by the Committee on Production to form an Industrial Council for the electrical industry.

Mr. HEALY said that Mr. Wordingham had evidently an incomplete knowledge of the scope and objects of the E.P.E.A., and traced the history of the development that had taken place from August last. He felt that the work done and the achievements recorded throughout the country warranted the claim of the E.P.E.A. to look upon the proposed association as merely duplication. While all were animated with the desire for complete unity, it was necessary to avoid repetition of work that had already been done.

In replying, Mr. WORDINGHAM dealt with all the points raised, and trusted that the claims made as to who were represented by the E.P.E.A. would be substantiated. He issued an invitation to the Association to send delegates from the various divisions throughout the country to discuss the whole question with the I.E.E. On a resolution being put, this was unanimously agreed to by the meeting, and an early date was fixed prior to the mass meeting proposed to be held in London in July.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Coal Consumption in Large Generating Stations.

Having recently read the Interim Report on Electric Power Supply in Great Britain by the Coal Conservation Sub-Committee, and having also seen a letter in one of the English electrical journals (I forget which) in which the view is expressed that the proposal to establish super-stations should not be carried too far, as a greater number of stations would give more satisfactory service, I think a few comments bearing on this subject may be of interest.

I had occasion not long ago to investigate, in a fairly thorough manner, the rates of coal consumption obtaining in many steam-driven generating stations in Canada and the United States. Records from many stations were obtained, and these were divided into various classes as follows:—

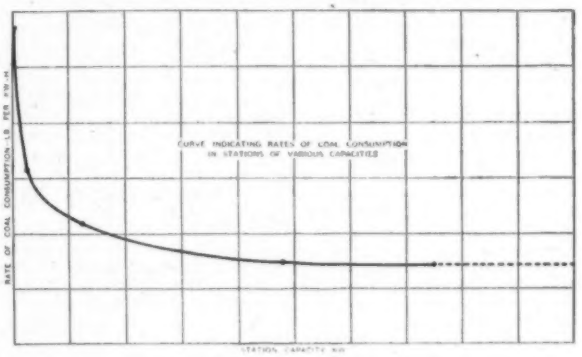
Class A.—Stations up to 1,000 KW. capacity.
Class B.—Stations from 1,001 to 5,000 KW. capacity.
Class C.—Stations from 5,001 to 10,000 KW. capacity.
Class D.—Stations from 10,001 to 50,000 KW. capacity.
Class E.—Stations from 50,001 to 100,000 KW. capacity.
Class F.—Stations above 100,000 KW. capacity.

The records covered, in all, some 155 station-years of operation; those of most of the individual stations covered five years, and a few four years, but in no case less than the latter figure for any one station.

There was only one station in each of classes E and F, but as the records of such large stations are usually kept with greater accuracy than those of smaller stations, it was considered that the degrees of accuracy in the various classes would thus be approximately balanced.

The figures for the different stations in each class were averaged, and a curve was drawn representing the rates of coal consumption per KW.-hr. in each class of station.

Naturally, this curve, which is remarkably steady, starts at a high value for the small stations, and comes down rapidly as the size increases; but, at a point representing a station capacity of about 75,000 KW. the curve is almost horizontal, and shows conclusively that in existing stations the saving in coal consumption beyond this point up to a station capacity of 150,000 KW. (the largest size from which records were obtained) is quite small, amounting only to about 7.5 per cent. The saving indicated between a station capacity of 125,000 KW. and 150,000 KW. is only about 2 per cent., and beyond a capacity of 150,000 KW., with present methods of burning coal and of steam generation and utilisation, the curve holds out no hope of further appreciable economies being obtained.



COAL CONSUMPTION PER KW.-HR.

Another noticeable feature of the curves plotted is that, in two stations of 95,000 KW. and 150,000 KW. capacity, having annual load factors of 37 per cent. and 44 per cent. respectively, the rate of coal consumption in the larger is only slightly over 2 per cent. less than in the smaller. Since load factor is practically certain to affect the coal consumption, this would indicate that the size of station has had no measurable effect whatever. It may here be remarked that the B.TH.U. per lb. of the coal used in the two stations referred to are almost identical, being, however, slightly higher for the smaller station, which would indicate that, with identical fuels, the larger station might show up a little better than it actually does. The difference, however, is only about 3 per cent., and would probably be accounted for by the difference in load factors referred to above.

To my mind, the argument to be drawn from the foregoing is that station capacities beyond 125,000 KW. or 150,000 KW. will be of no benefit whatever in appreciably reducing actual coal consumption in the electric generating station itself, unless the load factor can be *very materially* increased over that at present obtained in most steam-driven stations. On this continent load factors of over 90 per cent. are to be found at many of the large hydro-electric stations at Niagara Falls and elsewhere, but half of this may be considered a high value for even the very large steam-driven stations.

In super-stations, of course, economies may be made in capital expenditure, operating costs, &c., and the gasification of the coal and the obtaining of by-products may be more feasible at very large stations than in those of more moderate size; but that the question of putting one's eggs into very few baskets, instead of segregating them a little more, is worthy of very serious consideration, especially in view of the facts here presented in regard to actual coal savings obtainable in the two cases, before any definite scheme is embarked upon, seems evident. The diagram herewith represents approximately the shape of the curve mentioned above.

Alfred S. L. Barnes.

Toronto, *May 30th*, 1918.

The I.E.E. and the Proposed A.B.E.E.

We, the undersigned, Corporate Members of the Institution, protest against the action of the Council in spending Institution funds in financing the proposed A.B.E.E., as admitted in the Secretary's letter of the 12th inst. to Mr. Atkinson. It appears to us that this use of the Institution funds by the Council is *ultra vires* in view of paragraph 4 of the Memorandum of Association and of article 56 of the Articles of Association.

The amount of the expenditure is probably not large so far, but the matter is one of principle. We believe the Council acted without realising that their action was an infringement

of the rules of the Institution, as we contend, and we think the secretary has been remiss in not keeping them better informed. We consider the Council should forthwith repudiate all liability in connection with the proposed A.B.E.E., and leave its promoters to foot the bill themselves, or else get their prospective members to do it.

The Whitley Report was issued in March, 1917, and the E.P.E.A. (of which we are also members) was established in the early autumn of the same year, with objects which the proposed Association of British Electrical Engineers appears to have made a very good copy of, even to registration as a trade union, which the Council of the I.E.E. at first refused to agree to (see technical Press, April 5th, 1918).

The membership of the E.P.E.A. is considerable (over 1,000, and daily increasing), and includes already a considerable number of chief engineers and other senior executive officials on the power supply side of the industry.

The E.P.E.A. has had to pay its own preliminary expenses, but when certain London members in touch with the Council of the I.E.E. propose to form a rival association to the already-established E.P.E.A., the Council agree to pay the preliminary expenses of the proposed association, including the hiring of halls for mass meetings, and the travelling expenses of the promoters, out of Institution funds.

In our opinion, this shows a lamentable lack of impartiality on the part of the Council, and, what is more serious, that they are out of touch with the feeling amongst the majority of the younger members of the Institution.

We are told the Council wish to see one association only representing the electricity supply engineers, and we concur in this wish. But why, then, do the Council foster the formation of another when there are already in existence two associations, viz., the C.T.A.A., claiming to represent the senior members only amongst electricity supply engineers (and, therefore, a minority of the whole), and the E.P.E.A., who include in their membership all grades of qualified electricity supply engineers from top to bottom?

We suggest that the Council's action has been hurried and ill-advised.

To suggest a conference composed of delegates from mass meetings (some of which have been held in centres where no definite steps towards organisation have yet been taken, and, therefore, where there is presumably no considered opinion) is surely putting the cart before the horse.

If the Council are desirous of harmony in this matter it appears to us that instead of holding mass meetings, the President might ask the existing Associations, viz., the E.P.E.A. and the C.T.A.A., to meet him in conference, such conference to be on the basis of proportional representation of their respective memberships, say, one representative for every 100 certified members.

The proposed Association of British Electrical Engineers (Supply Section) would not, of course, be entitled to representatives at this conference, as it does not exist except in a provisional sense. By means of this conference we think the Council would then be taking a course which would appeal to all fair-minded men as evidence of a genuine desire to obtain the considered opinion of those who have had the vision to take the initial step in the formation and organisation of the existing associations.

Failing this, we think they would do better to let the various associations, including those representing the interests of the manufacturing engineers, work out their own destiny in their own way, and, probably, of their own accord affiliate, and then, possibly, claim recognition from the I.E.E., seeing that a considerable proportion of the membership of the I.E.E. will undoubtedly be included in the affiliated associations.

The work the I.E.E. has done in the past in its prescribed sphere of action, we believe all reasonable men will agree, has been good (though opinions may differ as to whether it might not have been better and more energetic), and has made the Institution respected the world over, in spite of the tendency during recent years of some consulting engineers to use its meetings as advertising media in a most brazen fashion. It is a pity, therefore, that this respect should be endangered by actions which, in the opinion of many people, are hasty, ill-considered, and by no means impartial, and which, if persisted in, will, we feel sure, weaken the Institution's influence for good in the electrical industry.

R. C. Atkinson, A.M.I.E.E., A.M.I.C.E., A.M.I.M.E.
Sidney Simpson, A.M.I.E.E., Assoc.A.I.E.E.
R. D. Spurr, A.M.I.E.E.
G. Morgan, A.M.I.E.E., A.M.I.C.E.
A. R. Chaytor, A.M.I.E.E.
P. Furness, A.M.I.E.E.

Coal Economy and National Health.

Lord Moulton, speaking at the annual conference of the Institution of Gas Engineers, is reported as having urged that gas and electricity should be placed on an even footing, and charged for in proportion to the amount of energy (heat) supplied to the consumer.

This would mean that a quantity of gas or a quantity of electrical energy, each equivalent to the same quantity of heat units, would cost the consumer the same amount of money. On this basis, if electricity were charged for at 1d. per unit, then the price of gas would have to be about 12s. 6d. per 1,000 cu. ft.

Of the heat produced by the gas, only a substantially reduced proportion can be usefully applied to the needs of the consumer, whereas in a well-designed electric fire or oven there is very small waste of heat. This fundamental difference is due to the inherent necessity of maintaining a draught during the burning of the gas, which draught carries away, into the outside air, a varying proportion of the heat produced by the gas flame.

Owing to this inseparable waste in connection with gas-produced heat, it would appear that gas must always be sold at a lower price than electricity as measured by their respective *gross* heating values, because the *net* heating value of gas to the consumer is inferior to the *net* heating value of electricity.

If Lord Moulton is correctly reported, he would seem to be advocating conditions that would give gas a very poor chance in the market, because it is inconceivable that anyone would use a gas fire on such terms of payment.

The framers of the new scheme for rationing coal, gas, and electricity have based their alternatives on sound lines, and, whether intentionally or not, allowance is made for waste of gas-produced heat. We are permitted to purchase either 750 heat units from the gas works, or 273 heat units from the electricity works, but the *net* value of these to the consumer will not be in anything like the same proportion. A mere statement of this kind is valueless without some evidence to support it, and I will, therefore, cite, as an example of the extraordinary economy of electrically-produced heat, a test that I recently made of an electric furnace for tempering steel. I found that I was able to maintain the required temperature of 900 deg. C. for one hour, with electricity equivalent to 6,000 heat units (exactly 5,971), whereas the gas furnace makers, for a furnace of the same size, require a consumption of gas equivalent to 75,000 heats units, which means that 69,000 gas-produced heat units must be blown away to waste in warming the wide world instead of the furnace. In this calculation I have assumed that the value of the gas is 500 heat units per cubic foot, which is a fair average value.

This brings me to the main point that the 75,000 heat units would call for the carbonisation at the gas works of about 30 lb. of coal, against only about 6 lb. of greatly inferior coal used at the electricity works in attaining the same result.

Fortunately, the fine-quality coal used at the gas works yields coke and other valuable material for explosives and agriculture, and from the national point of view the gas works to-day are most important. That is no reason, however, why we should use gas for heating and cooking in a wasteful manner, when it could be very much more efficiently and beneficially employed in developing power in a gas engine or boiler.

A few words should be spoken into the public ear from the point of view of national health. Gas fires have met with considerably advertised testimony from medical men, but these all insist that the gas fires must be *properly fixed*. In other words, the flues must be kept clean, and free to carry away the products of combustion. In my own home, where I have electric fires, as well as the previously fitted gas fires, I have had to lengthen the flue pipes, and these should project at least 12 in. up the chimney. As originally fixed, the flue pipes terminated under, and did not project into, the chimney at all, and the atmosphere of the rooms soon became oppressive and unhealthy. This objectionable feature has been largely remedied by the alteration.

I wish strongly to emphasise the view that the country is putting gas to the wrong purpose in using it for heating and cooking, and we are thereby wasting coal.

C. Orme Bastian.

London, W., *June 11th*, 1918.

Labour and Bulk Supply.

On Tuesday, June 11th, a deputation comprising the Parliamentary Committee of the Trade Union Congress, and representatives of the Electrical Trades Union Executive, waited on the President of the Board of Trade, and put before him the views of organised labour on the national electric power schemes, and the report of the Coal Conservation Committee, with reference to the labour employed in power and sub-stations. The proceedings were private, but a report will be issued to the members of the Station Engineers Branches of the Electrical Trades Union.

H. H. Morton,
Secretary, Electrical Trades Union.
London Station Engineers, No. 1 Branch.

London, S.E., *June 14th*, 1918.

The Electrical Propulsion of Ships.

I have noted with interest the report of Mr. Eskil Berg's paper on "Thermo-Electrical Ship Propulsion," published in your issue of May 10th last, and the very ingenious reply to it by Mr. Stanley S. Cook in your issue of the 14th inst. As the inventor of the thermo-electrical propulsion system as used on the *New Mexico*, I would esteem it a favour if you would kindly allow me to pass a few remarks on the subject.

I am in perfect agreement with Mr. Cook that a propulsive efficiency compared with the shaft horse-power of 75 per cent. is out of the question. The *Lusitania* design had the supposed pick of the British talent put into it, and even this resulted in a propulsive efficiency of only 48 per cent. compared with the shaft horse-power, and this with propellers running at 190 R.P.M. at about 26 knots, requiring no less than about 70,000 shaft horse-power to overcome the resistance of just over 33,000 E.H.P. Had she been fitted with the "Paragon" system, with propellers running at a speed of 80 R.P.M., only 55,000 shaft horse-power would have been required to give the vessel the same speed, with the same displacement, the propulsive efficiency being no less than 61 per cent. It is, therefore, quite possible that after the official trials we shall learn that the propulsive efficiency for the *New Mexico* compared with the brake horse-power of the electric motors will be somewhere about 63 to 64 per cent., at her designed speed of 21 knots. I think that with full evaporation her spurt-speed will be more like 23 knots for a period of about one hour.

In raising the thermal-propulsive efficiency of ships, in the manner in which it is being done in the actual ships at work, there is an important reduction in weight (which means displacement and work), and also in properly designed plant, a material reduction in capital cost in connection with the "Paragon" plant.

It would be of interest if Mr. Cook could tell us where the vast improvement has taken place in the direct drive during the last 10 years, and also how he makes out a proper case of a 10 per cent. extra efficiency in favour of the geared turbine drive. To state that there is 10 per cent. extra efficiency in favour of the geared turbine drive is absolutely misleading, and "Paragon" ships already at sea for several years have proved this to be correct.

Any improvement in a steam turbine can be equally applied to either system of transmission, but the thing Mr. Cook leaves out of the argument is that at the present time it is not economically possible to bring about such a high ratio of reduction with gears as is being done with the electrical transmission, and thus the thermo-dynamic efficiency is in favour of the "Paragon" drive.

In the case of the single-reduction gear used on the *Neptune*, a reduction of only 9¼ to 1 was used, whilst in the electrically-driven *Jupiter* a reduction of no less than 18 to 1 was successful in gaining supremacy as tested at sea against both the latest design reciprocating steam engine and the geared turbine drives.

The vessels in hand at the present time run into many millions of pounds of capital, they include 150 cargo vessels of 3,000 tons, several high-speed passenger vessels, no less than seven modern super-dreadnought battleships, and five fine high-speed battle cruisers, each installed with 135,000 KW. of electric power, estimated to give them a sea speed of 35 knots.

William P. Durtnall.

London, S.W., *June 15th*, 1918.

WAR ITEMS.

Entertaining the Wounded.—On Friday afternoon last at the Church Hall, Leyton, Mr. H. Hirst gave an entertainment for wounded soldiers from local hospitals. It took the form of a grand assault-at-arms by the City and Metropolitan Police Athletic Clubs, H.M. Life Guards, and members of other well-known clubs. Mr. Hirst was present, as was also Major-General Sir Newton Moore, K.C.M.G., one of the new directors of the General Electric Co., Ltd. The arrangements were under the direction of Sergeant A. R. Mugridge, of the City of London Police. The entertainment, which was enjoyed by about 300 wounded men, was a great success in every way.

Control After the War.—While we believe there is very good ground for the Government view, as revealed more especially by the Ministry of Reconstruction and as approved by the House of Commons, that if Government control of industry and supplies were withdrawn immediately after the war a state of chaos and scrambling would ensue, that opinion is not held by some leaders of industry any more than by some merchants. For example, Mr. A. F. Pease, of Pease & Partners, as reported, considers that Government control ought to be abolished immediately hostilities cease. He sees no reason why trade should not be put on the normal basis of supply and demand the day Peace is declared. But what about the rationing of raw material, the organisation of the priority, or otherwise, return of suitable labour; what about the conflicting claims of essential and unessential industries to both of these? Can the Allies co-operate in the great work of returning to normal conditions if there be no control? In the coal trade Mr. Pease expects a hiatus between the time when the Government requires enormous munitions and the time when things return to the normal state. Men and soldiers who have worked and fought hard and continuously will need a holiday, and Mr. Pease thinks it may be necessary to shut down some works for a time. Probably it will be, but in all our thinking about after-the-war conditions we need to remember that demobilisation, owing to shipping and other conditions, will necessarily extend over a lengthy period. There will be some definite order about the return of men and the availability of material for restarting or continuing industries, public works, building operations, and so forth. We all find Government control extremely irksome, and the Government itself says that it wants to release its hold as speedily as possible, but surely even Mr. Pease must in his heart of hearts feel that the sudden release of that hold would land us in just that state of confusion that it is so necessary for us to avoid.

American War Notes.—Several interesting references to American electrical men's activities in connection with the war appear in the *Electrical Review and Western Electrician* for May 25th. We observe that Major A. A. Gray, formerly managing editor and vice-president of that journal, organised the Technical Publicity Bureau, Ordnance Department, Washington, D.C., for the purpose of co-ordinating the work of that Department with the industries through the medium of the trade and technical Press. Mr. M. C. Turpin, who has been connected with the Westinghouse publicity department for the past nine years, has become assistant to the manager of the above Bureau. Mr. C. A. Coffin, chairman of the General Electric Co., Schenectady, and head of the Franco-American Clearing House in New York, has the distinction of being the only officer of the Legion of Honour in America. The honour was conferred upon him by the French Government through M. Justin Godard, who has been in the States on a special mission, at a dinner on May 13th, in recognition of Mr. Coffin's services rendered as a member of the executive committee of the War Relief Clearing House for France, which is now under the direction of the Red Cross, and his efforts to promote the establishment of scholarships in French Universities for American students after the war.

The employés of the Westinghouse Electric & Manufacturing Co. and its subsidiaries subscribed $2,601,000 to the third Liberty Loan, $2,217,000 representing the subscriptions of the employés of the parent company, 32,048 finding $69.18 per capita.

Trading with the Enemy.—The "London Gazette" for June 14th contains further lists of persons and bodies in the following countries with whom trading is prohibited:—Argentine, Paraguay and Uruguay, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Netherlands, Netherlands East Indies, Norway, Persia, Peru, Portugal, Salvador, Spain, and Venezuela.

Non-Ferrous Metal Licences.—The "London Gazette" for June 14th contains a further list of those to whom licences have been granted by the Board of Trade under the Non-Ferrous Metal Industry Act.

Trading with Russia.—In the "London Gazette" for June 14th there are given particulars of further territory in Russia which is in hostile occupation.

French After-War Resources.—The order that a report shall be made upon the resources of France, and upon her probable economic needs immediately upon the declaration of Peace, has been published by the ministry of Commerce. Numerous private concerns have been occupied in collecting useful data for a long time past.—*The Times.*

Bolting the Door Against Bosch.—Reuter's Melbourne agent states that Mr. Jensen, the Commonwealth Minister of Customs, has prohibited the importation of magnetos bearing the name of Bosch, thus amending the former order applying only to Bosch magnetos manufactured in Stuttgart.

Federation of American Industries.—The New York correspondent of the *Times* states that the splendid support which the manufacturers of America are giving to the Government was emphasised at their War Convention on June 14th at Atlantic City, where the leading industrial representatives of the Eastern States, after pledging the unfaltering devotion of their resources to the war purposes of the Administration, set in motion a movement for the establishment of a great federation of industries of the country, embracing 300,000 large and small plants, employing 10,000,000 workers. "Give us such an organisation, linking the manufacturers of this country into one great federation," declared the chairman, "and there will be no problem during or after the war that it cannot solve."

Exemption Applications.—At the Brighouse Tribunal, F. Walker (30, Class A), an electrician employed by Mr. J. Kilburn, Victoria Mill, Brighouse, had his appeal dismissed.

At the South Shields Tribunal, the list of appeals included 20 cases from the Corporation tramways department. The National Service Representative said the re-examination result was that there were now only two Grade 1 men. Three were in Grade 2, 12 in Grade 3, two were rejected, and one held a final discharge. The tramways manager, Mr. J. C. Whiteley, read a letter from the Board of Trade Tramways Department stating that instructions had been received from the Ministry of National Service to the effect that the calling-up notices of men below Class A or Grade 1 were to be cancelled, and the calling-up of the men in the higher category was to be postponed until June 20th. The appeals of the two Grade 1 men were disallowed, the men to be called up on June 20th, and in the remainder of the cases conditional exemption for six months was granted.

At Colchester, five tramway employés were appealed for by the Corporation, four being in Grade 3. Three were granted six months' exemption, another was conditionally exempted, and the other man was ordered to be graded.

At Bridlington, the Corporation asked for exemption for the electrical engineer, and a mechanic and relief stoker

(Class A 2) at the electricity works. The former was exempted until September 1st, and the latter, who was last examined in 1916, is to be regraded.

At Bath, there were reviews of the cases of W. G. Clothier (35), traffic inspector with the Electric Tramways, Ltd., and A. W. Wadley (34, Grade 2), the only overhead linesman with the company. As the former's grading has been lowered from 1 to 3, the exemption was continued, and in the latter case it was admitted that Wadley was in a certified occupation, and the same decision was registered.

At Carlisle, the Tramway Co. appealed for R. J. Cooke, driver and traffic inspector. It was stated he had general supervision of all the drivers and conductors. They had no man above Grade 3 except Cooke, who was in Grade 2. It was essential that the cars should run; it was obvious that the man was doing very important public work. The staff had been depleted from 40 to 16. Exemption was refused.

At Eastbourne, in the case of G. Chuter (33, Grade 2), engaged on repairs, meters, wiring work, &c., at the Corporation electricity works, he was given 12 weeks' exemption, when his case will be considered with those of others of the staff. He is to be substituted if possible. In the case of another employé, aged 41, and in Class C 2, the National Service Representative withdrew his appeal against his exemption.

At Bourne (Lincs.), exemption until September 1st was granted to C. H. Robinson, of Grimesthorpe, electrician to the Earl of Ancaster.

At Grantham, the Urban Electric Supply Co., Ltd., appealed for T. W. Heritage (28, Grade 1), superintendent; N. W. Lockton (30, Grade 1), stoker; and A. Parnham (33, Grade 1) and P. A. Baxter (28, Grade 1), wiremen. The first two were each granted a month, and the others three months each.

Kendal Tribunal has given exemption until November 1st to F. Collinge (35, Grade 3), electrician, and A. T. Barnes (42), electrical engineer.

The Hastings Tribunal has granted three months' exemption to an employé of the Tramway Co. named Morris, who is in Grade 3.

Folkestone Tribunal has granted three months, with the Volunteer condition, and with leave to apply again, to the following employés of the Electricity Co.:—Messrs. Cooper (38, Class A), engine driver; Watkin (40, B 1), sub-station engineer; and Sutcliffe (37, B 1), fitter.

At Exeter, appeals were made by the City Council for F. R. Potter (43, Grade 1), G. Hutchings (43, Grade 2), and J. Gilliard (43, Grade 1), tramway employés. Mr. Baldwin stated that Potter and Hutchings were drivers and in a certified occupation, and had been wrongly called up. The Mayor stated that the military had no right to grade the men, and that the proceedings were *ultra vires*. The Military contended that the men were not registered as drivers, but in an occupation which was not certified. If they had notified their change of occupation they would not have been called up. The Tribunal gave each exemption so long as they continued in the certified occupation. Gilliard was stated to be a platelayer, and the Mayor said that it would be futile to exempt the drivers and not the man who enabled the trams to run. Exemption was refused as from June 26th.

The East Kent Appeal Court has dismissed an appeal filed by R. Clarke (41, Class A), electrical fitter with Messrs. Webster & Co., of Folkestone.

East Ashford (Kent) Tribunal has given six months' exemption to H. T. Dew (46, Grade 1), electrical engineer, of Kennington.

At Brixworth (Northants), on a National Service appeal, conditional exemption granted in 1916 to a man in charge of the electric light plant at a V.A.D. hospital, aged 40, was cancelled, and final exemption to August 31st substituted.

At Burnham (Somerset), the National Service Representative asked for withdrawal of exemption held by A. O. Mountstephens, engaged with the Electric Light Co. A month ago the case was put back to enable the Military to find a substitute, and as they have not done so the appeal was dismissed, and the exemption confirmed.

At Oxford, three months each were granted to A. W. Oakley (38, Grade 3), unit adjuster, and R. F. Haydon (30, Grade 3), driver, employed by the Tramways Co. National Service appeals filed against W. T. Cooke (27, C 1), electrical fitter with Messrs. Hill, Upton & Co., electrical engineers, and A. A. Whitaker (41, Grade 2), with Messrs. Lucy & Co., electrical manufacturers, were withdrawn, as the men are protected.

Before the Wilts. Appeal Court, the National Service Representative appealed against exemption held by W. J. Moran (34), electrician with Messrs. Bays & Co., electricians, of Swindon. It was stated that Moran had left the firm, and that he had been given six months on condition that he remained in his then occupation, as he was the only skilled electrician left to deal with that part of the firm's business. As Moran failed to appear, his exemption was cancelled.

Three months' exemption has been granted at Tonbridge to G. Spencer (36), electrical engineer.

At Houghton-le-Spring (County Durham), final exemption to the end of August was granted to an employé of the Newcastle Electric Supply Co. engaged in rebuilding boiler furnaces at the Philadelphia station.

Before the Rural Tribunal at Houghton-le-Spring (County Durham), the Military appealed against seven employés of the Tramways Co. Three general service men were directed to join up when substitutes are provided; the chief traffic manager, passed for general service, was given to the end of November, as was also the ticket and motor inspector (Grade 2). The appeals in the case of two Grade 3 men were dismissed.

At Harpenden, an appeal filed by H. J. Burgoyne (45, Grade 1), electrical fitter with Messrs. H. Salisbury & Son, Ltd., was refused, and he is to report for service by July 15th.

At Martley (Worcestershire), an appeal was made by F. Turner (37, C 1), in charge of the electric plant at Knightwick Sanatorium. It was stated that the work could not be maintained unless a capable substitute was provided. Exemption until August 31st was granted, with a view to a substitute being found.

Kidderminster Tribunal has granted exemption to August 31st to A. E. Jackson (37, Grade 3), a driver on the tramways.

At Worden, A. Cranfield (32, Grade 2), electrical engineer, of Whitworth, was given exemption until August 1st.

At the Birmingham Tribunal, Mr. A. Berkeley, electrical merchant, Handsworth Wood, Birmingham, applied for exemption. It was stated that he was married, aged 40, and passed Grade 3. The case had been previously adjourned for the man to be graded. Appellant stated that his stock, valued at over £5,000, consisted of all kinds of electrical goods. He supplied the chief controlled firms, 90 per cent. of his orders being executed on munition certificates. Berkeley added that he started business in 1903, and all his money was in the business. His present staff consisted of three girls and a man of 57. His previous staff of three men were in the Army. He was doing Special Police duty. Three months exemption was granted, with further leave to appeal, appellant to remain in the police force.

LEGAL.

THE KENSINGTON AND KNIGHTSBRIDGE AND NOTTING HILL CO.'S ARBITRATION.

ON Friday, June 14th, the Court of Appeal, composed of Lords Justices Pickford, Bankes, and Warrington, commenced the hearing of an appeal by the Kensington and Knightsbridge Electric Lighting Co. from the judgment of Mr. Justice McCardie upon the appeal of the Notting Hill Electric Lighting Co. from an award of Mr. James Swinburne; the earlier proceedings have been reported in our pages.

Mr. P. O. Lawrence, K.C., Mr. Vesey Knox, K.C., and Mr. C. D. Marriott appeared in support of the appeal; and Mr. Tomlin, K.C., and Mr. Bruce Thomas for the respondents.

MR. VESEY KNOX said it was an appeal from the judgment of Mr. Justice McCardie on a special case stated by Mr. Swinburne. Two questions only were raised upon the appeal, the first being whether a supply of electricity given by the Notting Hill Co. under certain Orders made by the Board of Trade under Sec. 6 of the Electric Lighting Act of 1909 was part of the business of the Notting Hill Co. within the meaning of a clause in an agreement between the two companies made in 1900 (October 25th); and the second question was whether the supply from the joint station of the two companies at Wood Lane for the purpose of supply of those fringe Orders was within the powers of the companies jointly or severally under a special Act passed in 1899. Mr. Swinburne had found that in respect of the supply under the fringe Orders the damage to the Kensington Co. had been £1,661 up to the end of the year 1916. Mr. Justice McCardie had decided that the supply under the fringe Orders was not part of the business of the Notting Hill Co. referred to in the agreement, and that it was not within the powers of the fringe Orders to use for the purposes of the fringe Orders the supply of electricity from the joint station. Mr. Justice McCardie had held that the Arbitrator's award was erroneous in respect of the item of £1,661. His Lordship had also decided other points in favour of the present appellants, as to which there was no cross appeal.

In the course of his arguments, MR. VESEY KNOX contended that the finding of the Arbitrator was correct, and that in respect of the breach of contract the plaintiffs were entitled to the damages he had awarded, viz., £1,661 up to the end of 1916, and that there was a continuing and increasing breach of the agreement.

MR. TOMLIN, on behalf of the respondents, contended that the agreement provided that the supply was to be within the statutory area, and that a reasonable amount was to be taken. He contended that the Notting Hill Co. had taken their maximum under the agreement, and that the word "business" in Clause 3 meant the supply of electricity to the defined statutory area of the Notting Hill Co. He submitted that there was no contractual obligation of which there had been a breach.

At the conclusion of the arguments their LORDSHIPS affirmed the judgment of Mr. Justice McCardie, and dismissed the appeal, with costs.

LORD JUSTICE PICKFORD, in delivering judgment, said that the "business" with which the agreement was concerned was the business of supplying electrical energy to the respective areas of supply which were authorised by the special Act, or as might from time to time be agreed upon. At the time the agreement was made they did not contemplate supplying electrical energy outside the area of supply, because at that time it was not possible, and it did not become possible until some 10 years afterwards. They had not to look outside the agreement in order to see what limitation

was to be put on the generality of the word "business," because they found the limitation in the document where the word was used. He thought that Mr. Justice McCardie was right in saying that he must limit the meaning to the supply of electricity to the defendants' statutory area and to the business of the parties at the time of the agreement. That being so, the supply by the fringe orders was not "business" which came within the terms of the agreement. That was sufficient to dispose of the case. For these reasons he thought that the appeal failed and should be dismissed, with costs.

Lord Justices Bankes and Warrington also delivered judgment, dismissing the appeal.

BUSINESS NOTES.

Iron and Steel Trade Policy.—We read in the *Times* that the British iron and steel manufacturers have taken an important step for securing the future position of their industry. "They have agreed to form a National Council on trade policy. The Council will be representative of all the ironmasters of the country, and, probably, of Labour interests as well. Its function will be to obtain closer organisation of export and production, and to assure the supply of raw material. Dr. Addison has secured the assent of a representative conference of masters and men to the establishment of a second body, an Industrial Council, to deal with all labour questions in every branch of the iron and steel trade."

Book Notices.—"Motor Transport Year Book and Directory." Vol. III. 1918, c. + 317. London: Electrical Press, Ltd. Price 12s. 6d. net.

"General Lectures on Electrical Engineering." By C. P. Steinmetz. London: Hill Publishing Co. $2.50.

"Science Abstracts." A and B. Vol. XXI. Part 5. May 31st. London: E. & F. N. Spon, Ltd.

"Willing's Press Guide" (James Willing, Ltd., London, 1s.) has reached its 45th year of issue. Its contents are arranged in a straightforward and businesslike manner for ready reference.

Amendment of Patent Specification.—The British Thomson-Houston Co., Ltd., has applied to the High Court for leave to amend the specification of Patent No. 21,513/06 for the treatment of metallic tungsten, by inserting after line 6, p. 6, the following new paragraph:—"We desire it to be understood that by the expressions 'coherent form' and 'coherent metal' in the claims, we exclude any forms of tungsten other than those agglomerated from tungsten powder and rendered very dense and strong by a heat treatment very near the melting point." And in line 15, by substituting "In the" for "The" and "claimed in claim 1" for "which consists in." Notice of opposition must be given by June 26th, 1918.

Patents and Alien Enemies.—Applications have been made by the Ministry of Munitions and the General Electric Co., Ltd., to the Board of Trade to avoid or suspend Patents Nos. 29,933/10 and 894/13 granted to R. Böcking et Cie, for cleaning furnace gases, and Nos. 20,823/11, 1,214/12, 1,215/12, and 8,752/12, granted to W. F. L. Beth, for filtering apparatus for gases.

Electrical Supplies for S. Africa.—There is an acute shortage of tubing, and what little can be picked up is 2s. 6d. higher. Several decent consignments of electric lamps have arrived at the coast from Holland *viâ* England; quite sufficient to relieve any prospective shortage during the next few months. One firm also received 60 gross of blocks this week. However, business is slack, chiefly because our stocks are very low indeed. For example, concentric cable is the principal trouble to-day, as little can be had, therefore in some cases the municipal street cables cannot be connected to the house and other installations. The Japanese supplies of electrical materials are disappointing, as so much was expected, and so little has been accomplished, so far.—*S. A. Mining Journal*, May 11th, 1918.

Lists.—Messrs. Meldrums, Ltd., Temperley, near Manchester.—Illustrated circulars relating to their combustion appliances, also their castings and apparatus for chemical works.

Bankruptcy Proceedings.—A. E. Felgate & W. Storey (Felgate & Storey, electrical engineers, Reading).—Supplemental dividend, 1¼d., payable June 20th, at Official Receiver's offices, 14, Bedford Row, London, W.C. A. E. Felgate (separate estate), first and final dividend of 1¼d. in the £.

Electrical Industry at Wolverhampton.—The Council of the Wolverhampton (Incorporated) Chamber of Commerce, in their annual report to the Chamber, remark:—"The demand for electrical plant during the past year has continued to be abnormal, but the difficulty of obtaining raw materials is daily becoming more serious. . . . Local factories have, we understand, been exceedingly busy."

For Sale.—Hampstead B.C. invites tenders for a Davey-Paxman boiler, Green's economiser, two steam superheaters, and six thermal storage drums. Rochdale Corporation Electricity Department invites offers for two 150-kw. d.c. generators, spare armature, Bellis three-crank compound engines and condensers. A number of d.c. motors are offered for sale at Rhondda Valley; Newcastle-under-Lyme Corporation Electricity Department invites offers for two 45-b.h.p. Stockport gas engines, coupled to two 30-kw. E.C.C. shunt-wound 220 to 330-volt dynamos, &c. For particulars see "Official Notices" to-day.

Liquidations.—Malta Tramways, Ltd.—Creditors must send the usual particulars to the liquidator (Mr. J. R. Tulloch, 4th, Frederick's Place, Old Jewry, E. 2), by July 27th.

Patent Application.—The application of Dr. J. A. Fleming and Marconi's Wireless Telegraph Co., Ltd., for extension of Patent No. 24,850 of 1904 is not to be heard before October 30th.

LIGHTING AND POWER NOTES.

Aberystwyth.—Water Power.—A Sub-Committee of the T.C. has under consideration the water power of the Rheidol Valley, and Prof. O. T. Jones is to be asked to advise on the matter, it being considered that the Rheidol can provide unlimited power for electricity purposes.

Barnsley.—Mains Extension and Price Increase.—The T.C. proposes to extend the mains to supply energy to the works of Wood Bros., at a cost of £3,000. The question of raising the charges for energy is being considered, together with an application for energy for an electric furnace, sent in by Wilson and Longbottom.

Birmingham.—Year's Working.—The annual report of the year's working of the Corporation electricity department shows total revenue £861,601: working expenses, £620,740; gross profit, £240,861; after making provision for income-tax and sinking fund charges, placing £6,727 to reserve, £39,500 to renewals and special expenditure, the balance (£25,263) has been allocated to the rates account. During the year 160,275,400 units were sold, 131,329,751 for lighting and power and 28,945,649 for traction, an increase in the units sold of 10,550,763 units. The average price obtained per unit was 1·29d., as against 1·16d. in the previous year; total motor connections, 131,912 h.p.

Brierfield.—Price Increase.—In pursuance of its agreement with the Nelson Corporation, the U.D.C. has resolved to increase its charges for the supply of electricity for lighting and power to the prices charged at Nelson.

Burton-on-Trent.—Year's Working.—During the past year the Corporation electricity undertaking earned a total revenue of £27,203; working expenses amounted to £15,692, and after deducting loan charges, £6,474, contributions to capital expenditure, £1,013, and special expenditure (including £221 bonus under the profit-sharing scheme), £709, there is a surplus on the year's working of £3,313, which, with £663 transferred from the renewals fund, it is proposed to allocate as follows:—£3,063 for the new mains to the rubber works at Horninglow and £913 for mains extensions services and transformers. The total number of units sold during the year amounted to 4,394,969, an increase of 401,772, or 10·06 per cent. as compared with 1916-17. Power supply showed an increase of 368,212 units. The total average works cost was ·857d., as against ·728d. in 1917, and the total costs 1·304d., as against 1·259d. in the previous year.

Cleckheaton.—Accident.—Through the bursting of a steel band on the armature of a generating set at the electricity works, on Tuesday, June 11th, the whole of the plant was shut down for 24 hours, no duplicate part being available; the other three sets had to be dismantled in order to effect the necessary repairs.

Colchester.—The T.C. has decided to give the Secretary of State for War a year's notice to terminate the present agreement for the supply of energy from July 1st. The Council has asked the War Office to pay an additional 10 per cent.

Continental.—Denmark.—Hydro-Electric Scheme.—A scheme for the utilisation of the water power in the Gudenaa, in Jutland, has, reports H.M. Minister at Copenhagen, passed the first reading in the Danish Landthing, and has been sent to Committee for consideration. It is proposed to construct a dam across the valley of the River Guden below the junction with the Tange, and deepen the bed of the river from Bjerringbro to Tange, so that a fall of about 9 metres can be obtained. It is expected that 600,000,000 cb. metres of water per annum can be obtained; this will produce 15,000,000 effective h.p. units, or 10,000,000 kw. per annum, of which, it is estimated, only about 8,000,000 kw. will be utilised. The cost of the undertaking is estimated at about £225,000, and, provided the materials for construction are obtainable, the work could be completed within one and a half years. The present difficulties experienced in producing light and power by the employment of coal have made the question one of consider-

able importance to the districts concerned. In spite of the increased cost of material, it is thought that by means of the new power station it will be possible to produce electricity at a much cheaper rate than is the case at present, and that the whole of central Jutland will benefit by it. It is pointed out that the scheme will enable Denmark to obtain power and light without being dependent on raw materials from abroad.—*Board of Trade Journal.*

Sweden.—The Bergsjo Kraft Aktiebolag is the name of a new undertaking that has lately been formed at Bergsjo, Sweden, with minimum and maximum capitals of £7,200 and £14,000 respectively, to establish a small hydro-electric generating station for the supply of energy for lighting and power purposes.

Spain.—Our correspondent in Spain sends the following:—*New Transmission Lines:* The Sociedad Minera y Metalurgica de Penarroya is installing three new lines as follows:—

1. An overhead line of 70,000 volts from the generating station of Pueblonuevo del Terrible to Villanueva de Cordoba. This will connect the Penarroya central station with the hydro-electric installations in Linares, owned by the Mengamor Co. This line is now completed.
2. An overhead line of 30,000 volts from the generating station of Pueblonuevo del Terrible to the City of Cordoba, composed of two sections. The first section (Pueblonuevo del Terrible to La Ballista) is already installed, and the second section (La Ballista to Cordoba) is just started. This line is to supply electricity to the City of Cordoba and to the newly-founded Sociedad Espanola de Construcciones Electro-Mecanicas.
3. Three lines from Espiel to the Restamada and Candelaria Mines and to the coal briquetting plant recently installed by the Penarroya Co.

The Gijon Electricity Co. has been granted permission to run a high-tension line from Avilés to the Port of San Juan de Nieva, a distance of about 40 miles.

Crewe.—Price Increase.—The Corporation has decided that the present charges for electricity be increased by 12½ per cent. as from next month. There is a deficiency on the electricity undertaking of £644.

Dublin.—Loan Application.—Mr. P. C. Cowan, Chief Engineering Inspector, Irish Local Government Board, held an inquiry, last week, into an application of the Corporation for sanction to a loan of a sum of £175,000 for the purpose of carrying out extensions to the electricity undertaking. At the outset the inspector remarked that the Corporation did not say from whom it proposed to borrow the money if sanction were given. Mr. S. Orr, on behalf of the Citizens' Association, asked that the loan should stand postponed until it was definitely known what action, if any, the Government proposed to take in the national scheme of generation and distribution of electric power. In the alternative, he urged that, unless a case of extreme necessity was established, no loan for even a partial replacement of the present plant by new plant should be sanctioned; that if a case for renewal of plant was shown, it should be considered whether the cost of such renewal should not come out of revenue; that as the proposed loan would bring the municipal debt to above £3,000,000, it should not be sanctioned unless it was clearly established that a reduction in the city's abnormally heavy rate burden would be the outcome; and that the expenditure on the proposed extensions and the tunnel under the River Liffey should not be sanctioned unless direct and conclusive evidence was forthcoming of the immediate establishment of new industrial factories in the harbour district.

For the Corporation, Mr. Philip White said the loan was divided into three sections—£60,000, £50,000, and £65,000. Of the former, £25,000 was wanted for boilers and plant and £35,000 for engines and dynamos. Of the £50,000, £15,000 was for the tunnel construction and £35,000 for cables, sub-station, and contingencies; and the £65,000 was for distribution work. The existing plant demanded a great deal of attention. Last year the demand for power and light was such that there was little chance of carrying out repairs; they now wanted some plant they could fall back upon. Mr. H. Campbell, town clerk, said that extension of the electricity works could not be further postponed. He understood the War Office authorities were going to take electric power at the North Wall from the Dublin United Tramways Co. over the heads of the Corporation—the sole body, he contended, that had statutory right to supply it.

The Inspector read a letter from Dublin Castle to the Local Government Board, in which it was stated that the War Office had decided that the power required for hydraulic hay-presses at Alexandra Dock should be obtained from the Port and Docks Board's electric installation, supplemented by a stand-by connection to the Port and Docks Board's mains from the Tramways Co.'s power station at Ringsend. As both the Board and the company were prohibited by Act of Parliament from supplying energy otherwise than for their own purposes, it was intended to issue orders under the Defence of the Realm Act for the supply of the power. The Corporation was at present unable to give a supply at North Wall, and could not do so in time for the War Office requirements. The Inspector said the War Office requirement in the matter was urgent, but only temporary, and the right of the Corporation would not be affected in any way. Evidence of the Corporation's borrowing powers was then given by Mr. H. Morgan, the city accountant.

Dewsbury.—Owing to the probable shortage of coal, the Electricity Committee has notified all consumers that no new work should be started, or apparatus bought, without sanction being first obtained from the Committee.

Faversham.—Reduced Consumption.—The electrical engineer has reported to the T.C. that the return of electricity consumption for May shows a reduction of only 2·9 per cent., whereas the Restriction Order requires a reduction of about 20 per cent. It was explained that some allowances had to be made for new customers. It was decided to apply for exemption from the Order in the case of the sewage pumping station, which must be kept running.

Fife.—Mains Extension.—Arrangements are being made for the laying of a cable from Crossgates to Burntisland, to supply power for the shipyard at Burntisland, and other industrial purposes.

Harrogate.—Price Increase.—The T.C. has decided to advance the price of energy for lighting by another 15 per cent., making a total increase during the war of 25 per cent.

Kettering.—Year's Working.—Annual Accounts.—The report of the year's working of the U.D.C. electricity undertaking to March 31st shows total revenue £22,815; working expenses, £15,585; gross profit, £7,230. Interest and sinking fund charges amounted to £6,137, leaving a balance on the year's working of £1,093, which with £4,275, balance from last year's account, and £45, in all £5,413, has been carried forward to next account. Total units sold, 2,718,585; total maximum demand, 1,496 kw.

Slaithwaite.—The B. of T. has extended the electric lighting order for a year from July, 1918.

Sleaford.—Price Increase.—The U.D.C. has decided to increase the price of electricity by ½d. for all purposes, the increase being approximately 10 per cent.

Sunderland.—Year's Working.—The annual report of the electricity department shows an increase in the amount of electricity sold, by comparison with the preceding year, of 14 per cent. in power supplies, 0·3 per cent. in lighting and heating, and 0·6 per cent. in traction. The load factor was 26·72 per cent., as against 26·53, and the maximum load was 7,400 kw., as against 6,700; units sold were 17·32, against 15·61 in the previous year. The report states that the new 7,500-kw. turbo-generator was not available, but every effort was being made to get it into commission before the winter. The Committee had decided to erect a new cooling tower and install larger boiler-house plant. The accounts show a revenue of £85,324, and, after meeting expenditure, there was a balance of £34,124. This balance, after payment of £10,513 for interest on capital, &c., was reduced to £22,431, appropriated as follows:—Repayment of loans, £17,816; redemption of lands, £120 16s.; superseded plant, £3,826; and £668 depreciation of stock.

Walsall.—The Town Council has decided to extend the supply mains, at a cost of £4,200, to give a supply of current to the Holly Bank Colliery Co.

Warrington.—Price Increase.—The T.C. has increased the charges for energy for all purposes other than tramways, by 10 per cent., as from the end of June.

TRAMWAY AND RAILWAY NOTES.

Bradford.—Result of Fare Increase.—The increase of 50 per cent. in the tram fares has so far been successful. The manager of the tramways department (Mr. C. J. Spencer) stated to the Committee, last week, that the receipts for the first nine days under the increased charges had been £13,099, as compared with £9,906 for the corresponding period of last year. This represented an increase of 32 per cent., whereas the official estimate was 30 per cent. when the increase was decided upon. It is understood that the number of passengers had been considerably reduced, and the shorter queues have been very noticeable.

The Tramway Committee has decided to make a reduction in the number of stopping places on the various routes of the system.

Brighton.—Year's Working.—The Corporation tramways accounts show a surplus of over £15,000. Nearly 17,000,000 passengers were carried during the year.

Canada.—Wage Increase.—As a result of negotiations Montreal Tramways employés have been given increases of wages averaging 20 per cent.—*The Times.*

With a view to conserving fuel, the Montreal Light, Heat, and Power Co. has entered into an agreement to supply the Montreal Tramways Co. with additional hydro-electric power, thus restricting the use of coal for the tramway company's steam plant; the arrangement will continue for 18 months, and is estimated to save about 37,000 tons of coal. The tramways company is supplied with a certain amount of power under agreement by the Montreal Light and Heat Co., but the peak load at the busy hours is taken by the tramway company's steam plants, a new plant having been recently installed. The new agreement is likely to call for at least 10,000 h.p. per annum.—*Canadian Electrical News.*

Dover.—Women Drivers.—Women drivers are to be employed on the Corporation electric tramways, and are to be paid the same rate of wages as the men.

London.—Sunday Service.—Commencing on Sunday morning, June 16th, the Sunday through services between the L.C.C. and the Metropolitan Electric Tramways were resumed. The suspension of these services during the past few weeks caused considerable inconvenience to workers.

New Zealand.—Electric Vehicles.—According to the *Board of Trade Journal*, the Christchurch city authorities propose to lay themselves out to encourage the use of electric vehicles. At present they have a charging station attached to their works in which they receive electric cars overnight, keeping them in order and garaging them, for the sum of £26 a year. The cars are charged at night, or as opportunity offers, and payment for current is assessed according to the amount taken. At a later date, when power is available, it is proposed to have charging stations at various points throughout the province, and it is expected that when these arrangements are made a big business will be done with electric vehicles for use throughout all the country districts. At present these vehicles are used practically solely within the town radius. One large firm has stated that it would not pay them to use petrol wagons as against electric wagons, even if the petrol wagons themselves were supplied free of charge at the beginning. The use of these vehicles may also spread in other districts of New Zealand, not because of their efficiency, but because of the high price of petrol.

Otley.—Protest against Increased Fares.—The District Council has raised a strong protest against the Leeds Corporation's increased fares between Guiseley and Otley (a trackless system), and it was pointed out that this was in direct contravention of the understanding come to on March 9th, 1914, by which it was laid down that the fare for that distance should not exceed 3d. There was not, it was contended, as much wear and tear on a trackless system as there was on rail systems. The matter has been referred to the clerk, and the local Tramways Committee.

Wigan.—Strike.—Last week the employés of the Corporation tramways threatened to hand in their notices unless the Committee agreed to six inspectors and a cash clerk, who had seceded from the National Society of Municipal Officers, joining the Vehicle and Tramway Workers' Union. Sir George Askwith asked the Committee to submit the matter for arbitration, so that the traffic should not be dislocated, and the Committee agreed to this course. On Saturday at noon, however, the drivers struck work, in defiance of the advice from headquarters to continue pending the arbitration. This is the second time during the war that the tramway employés have struck work contrary to the advice of their Union officials.

The employés, after an interview between Mr. Bradwell, the Union secretary, and the Corporation management, agreed to resume work on Monday, June 17th, pending the decision of Sir George Askwith on the matter in dispute.

TELEGRAPH AND TELEPHONE NOTES.

Breaking Insulators.—For wilfully breaking telegraph insulators, three small boys from Highfields were summoned at Doncaster, last week, and fined 20s. each, all three having previously been before the Court. They had broken 20 or 30 insulators, one of them acknowledging to breaking 11 with a catapult.

The Imperial Wireless System.—Replying in the House of Commons, last week, to Sir John Butcher, who asked whether reasons could be given why the Marconi contract for the erection of wireless stations had been repudiated by the then Postmaster-General, Mr. Illingworth (Postmaster-General) said that in January, 1915, the then Postmaster-General informed the Marconi Co. that the principal reason which had actuated the Government in arriving at the decision in question was the altered circumstances resulting from the war, and especially from the prospect that hostilities might be prolonged. He stated that, in the opinion of the Government, the present and prospective naval and military requirements, which were the governing factors in determining the scheme for the Imperial wireless chain, could be better met by means other than the construction of stations of the character, and in the situations, contemplated by the contract.—*Birmingham Daily Post.*

CONTRACTS OPEN AND CLOSED.

OPEN.

Lancaster. — July 16th. Electricity Committee. 6, 9, and 12 months' supply of slack or nuts (screened and washed). Mr. J. B. Patterson, Electricity Works, Marton Street.

London. — Fulham. — July 10th. Borough Council. Cables, ducts and accessories for the linking-up of the Fulham and Hammersmith Electricity Works. See "Official Notices" to-day.

Manchester.—June 26th. Work in connection with the widening of coal railway between Stuart Street and the Ashton Canal for the Electricity Committee :—(*a*) General contractors' work. (*b*) Steelwork in bridge over Stuart Street. Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall.

Morecambe.—Electric Light Committee. 2,000 tons of rough slack. See "Official Notices" to-day.

CLOSED.

Australia.—Eugene F. Phillips Electrical Works, Ltd., Montreal, have received an order from the Postmaster-General's Department of the Australian Commonwealth for about a million feet of paper-insulated lead-covered telephone cable. This is believed to be the first order from this source which has been placed in Canada. The company have also received an order for paper-insulated lead-covered double-steel tape-armoured telephone cable from the Union Government of South Africa.—*Canadian Electrical News.*

Poplar.—Electricity Committee. Tenders recommended :
Chain grate stokers.—Underfeed Stoker Co., £2,287.
E.H.T. and L.T. cable.—Pirelli, Ltd., £2,698.
L.T. cable.—Western Electric Co., Ltd., £3,305.

Stepney.—The Electricity Committee has accepted the offers of Messrs. E. Foster & Co. for 9,400 tons of coal, at from 23s. 5d. to 31s. 11d. per ton.

FORTHCOMING EVENTS.

Incorporated Municipal Electrical Association.—Friday, June 21st. At the Town Hall, Manchester. At 9.30 a.m. Council meeting. Resumed discussion on "Electric Power Supply." Annual general meeting.

Junior Institution of Engineers.—Thursday, June 27th. At 3 p.m. Visit to the Gnome & Le Rhone Engine Works (Messrs. Peter Hooker, Ltd.,) Blackhorse Lane, Walthamstow.

Friday, June 21st. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "The Heating of Industrial Buildings," by Mr. M. H. Jones.

Monday, June 24th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Lecture on "The Stokes Gun," by Sir Wilfrid Stokes.

Physical Society of London.—Friday, June 28th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. General meeting.

NOTES.

Foreign Trade.—The May Figures. — The official returns of imports and exports during last month contain the following electrical and machinery figures :—

	May, 1918.	*Inc. or dec.*	*5 months*, 1918. *Inc. or dec.*
Imports.			
Electrical goods ...	81,129	— 18,645	— 225,792
Machinery	990,717	+202,338	+ 1,109,617
Exports.			
Electrical goods ...	375,001	+137,903	— 480,117
Machinery	1,694,822	— 462	— 1,914,882

Notes from Spain.—Our correspondent in Spain sends the following :—

Olive Oil for Diesel Engines.—The Triana central station, in Melilla (Morocco), has been shut down several times during the past three years for lack of mineral oil for its Diesel engines. Some recent experiments with olive oil proved that olive oil alone is not suitable for the Diesels installed at Melilla, but a mixture of two parts olive and one part mineral oil (petroleum) gave excellent results. Unfortunately, the difficulty in obtaining petroleum is still acute, and further experiments are being made with vegetable oils.

In this connection it is interesting to note that the Spanish Government has just awakened to the fact that no petroleum has arrived in Spain for about a year. As a remedy, the Spanish Consul at Tampico (Mexico) points out that several small oil wells in Mexico are in the hands of Mexicans, and their product is therefore available in Spain and other neutral countries, if only transport can be supplied.

A New Spanish Industry.—A French company has acquired some important waterfalls at Esera and Cinca (Aragon), and will shortly erect hydro-electric plants for the manufacture of fertilisers.—*Heraldo de Aragon.*

Hydro-electric Development.—The Valencia Chamber of Commerce has opened a public inquiry respecting the benefits which would accrue to the Valencia region through the utilisation of a waterfall on the river Jucar, in the Province of Albacete. From this fall 6,398 H.P. could be transported to Valencia.

A great number of applications for water-power concessions have recently been presented from all parts of the kingdom, ranging from 3,620 H.P. (town of Alloz, Navarra), to 20 H.P. (Salas de los Infantes, Burgos). The smaller units required will be supplied by Spanish manufacturers, while the larger ones, water turbines and alternators, will probably come from Switzerland. An additional Escher Wyss-Brown-Boveri set of 1,500-K.V.A. capacity has just been installed by the Sociedad General Gallega de Electricidad.

Volunteer Notes.—LONDON ARMY TROOPS COMPANIES, VOLUNTEER ENGINEERS.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Corps Orders No. 25 by Lieut.-Colonel C. B. Clay, V.D., Commanding.
Captain of the Week.—Capt. W. Hynam.
Next for Duty.—Capt. W. Darley Bentley.
Sunday, June 23rd.—Commandant's Parade at Waterloo Station, 8.45 a.m. Work: Revetments at Heywood. Dress: Service dress, drill order, haversacks, and water bottles. Mid-day and tea rations to be carried.
Monday, June 24th, to Friday, June 31st.—Drills as usual.

C. HIGGINS, *Capt.* R.E., *Adjutant.*

Constantinople Tramway and Electricity Undertakings.—Some information has just become available respecting the transport and supply undertakings at Constantinople during the war. It may be remembered that various financial groups in Belgium, France, Germany, Hungary, and Switzerland formed in the course of the year 1911 a working community under the title of the Consortium de Constantinople, for the purpose of combining the transport and electricity undertakings in the Turkish capital under a central administration. The Consortium acquired most of the capital in the Constantinople Tramway Co., and the whole of the capital in the Galata-Pera Rope Railway, and also concluded a working agreement with the Belgo-Hungarian group, who held the capital in the Société Ottomane d'Electricité and the Stamboul Gas Co. The Consortium next embarked upon the conversion to electric traction of the then existing tramway system, and sought to secure concessions for the construction of additional tramways and for an underground railway of a length of about 4·3 miles, which was to connect Stamboul with Galata and Pera by means of a tunnel under the Golden Horn. The concession for the latter was granted in 1912, and the preliminary survey was made, but the execution of the scheme has been postponed in consequence of the war. In August, 1913, electrical working was inaugurated on one tramway, and this has since been extended to the other tramlines. The Société Ottomane d'Electricité, in the meantime, had built a new generating station, which was opened in March, 1914. Three months later—June, 1914—the Société de Tramways et d'Electricité de Constantinople was formed in Brussels, with a share capital of £720,000, for taking over all the interests of the Consortium in Constantinople, and this transfer is reported to have been sanctioned in November, 1916. The working receipts of the various undertakings since 1914, according to information published in German newspapers, has been as follows in Turkish £:—

RECEIPTS IN	1914. £T.	1915. £T.	1916. £T.	1917. £T.
Tramways	189,494	232,067	285,600	342,177
Galata-Pera Railway	42,560	†2,'47	38,989	54,074
Electricity works (receipts)	31,117	70,939	137,509	222,730
Electricity works (supply in KW.-hours)	5,816,355	9,968,550	14,818,900	21,443,003

The above figures show that the revenue earned by the tramways and the electricity works has constantly increased despite the difficulties caused by the war, particularly in the dearness of raw materials and of labour. Nevertheless, it is stated that the tramway company has been able to pay a dividend of 5 per cent. in each of the past four years, and the Galata-Pera Co. distributed 11 per cent. for 1916, and is expected to pay 10 per cent. for last year. On the other hand, the electricity supply company, which has to cope with the greatest difficulties on account of the scarcity of coal and other raw materials, will probably record a loss on working in 1917. The company had 16,821 customers at the end of 1917, representing a connection of 13,878 KW., as compared with 10,838 KW. at the close of 1916.

The Société de Tramways et Electricité de Constantinople is reported to have acquired in July, 1916, the whole of the share capital in the Stamboul Gas Co., which had suspended the production of gas at the beginning of 1916 owing to the lack of coal. The former, whose financial year ends on June 30th, is stated to have paid 4½ per cent. in 1914-15 and 1915-16, whilst the profits obtained in 1916-17 have been applied to depreciation.

Conciliation and Arbitration.—The Whitley Committee on the Relations between Employers and Employed have presented a further report, which is now published by Dr. Addison, Minister of Reconstruction. It deals with conciliation and arbitration. The Committee pronounce definitely against any system of compulsory arbitration, on the grounds that it is not generally desired by employers and employed, that it has not proved a successful method of avoiding strikes during the war, and that it would be less likely to be successful in time of peace. They also pronounce against any scheme of conciliation which would compulsorily suspend a strike or lock-out pending an inquiry. The Committee advocate the continuance, however, of the present machinery for voluntary conciliation and arbitration, and hope that the setting up of Joint Industrial Councils (on the lines recommended in their earlier reports) will tend to the growth of such machinery. They consider that there should be means for holding independent inquiry into the circumstances of a dispute and for making an authoritative pronouncement thereon without the compulsory power of delaying the strike or lock-out. Their main constructive suggestion is that a Standing Arbitration Council should be established on the lines of the present temporary Committee on Production. To this Council disputants would be able voluntarily to refer such differences as they are themselves unable to settle. It is suggested, however, that single arbitrators should be available for less important cases, which could be heard locally. It is further suggested that the Standing Arbitration Council should take means to secure the co-ordination of arbitrators' decisions. The Committee are opposed to the enforcement of awards and agreements by means of monetary penalties. The report is available from H.M. Stationery Office, Imperial House, Kingsway, W.C. 2, price 1d.

The Canadian Fuel Situation.—In the April 15th issue of the *Electrical News* there are reproduced a number of papers dealing with the fuel situation, and more particularly the relation between electricity and the relief of the fuel shortage, presented before the recent professional convention of the Canadian Society of Civil Engineers, held in Toronto. Although there may have been no great amount of new information brought forward in those papers, yet the conference was notable, in that it indicated the interest professional engineers were taking in the situation, and showed that they were in possession of all the knowledge necessary to supply a solution of the difficulties under which they had laboured during the past winter.

The conference, unfortunately, was not able to prove that electricity can compete, in dollars and cents, with coal as a source of heat supply. There is not sufficient electric energy available to supply the general needs of Canada. Immediate relief, therefore, must come from some other source, and in this respect wood was recommended as the most easily available, and, after that, peat: the latter fuel, however, could not be available until the winter of 1919. It was pointed out that water power must take a very prominent part if the best use of the varied fuel resources of Canada was to be achieved.

The conference was also of interest in that considerable light was thrown upon the possibilities of general electrification of railways. It was shown that while this was an end to be worked for, there was no immediate prospect that the coal situation could be relieved during the next two or three years by electrifying the railways of the Province of Ontario in any except isolated cases. When conditions arrived rendering such electrification possible, the fuel saving would be very great. The papers constitute a record of information which will be found of great value.

WATER POWERS IN EUROPE AND NORTH AMERICA.

Country.	Population.	H.P. available.	H.P. developed.	Per cent utilised
U.S.A.	98,783,300	28,100,000	7,000,000	24·9
*Canada "A"	8,033,500	18,803,000	1,735,000	9·2
†Canada "B," populated	8,000,000	8,094,000	1,725,000	21·3
Austria-Hungary	51,173,800	6,460,000	566,000	8·8
France	39,601,500	5,587,000	1,100,000	11·6
Norway	2,391,780	5,500,000	1,120,000	20·4
Spain	19,588,700	5,000,000	440,000	8·8
Sweden	5,522,400	4,500,000	704,500	15·6
Italy	28,601,000	4,000,000	976,300	24·4
Switzerland	3,781,500	2,000,000	511,000	25·5
Germany	64,926,000	1,425,000	618,100	43·4
Great Britain	40,831,400	963,000	80,000	8·3

* "A" excludes Yukon and Northern Area improbable of immediate development. † "B" included in "A" is area actually settled.

"Safety First" in Industry.—Lord Leverhulme, presiding at a Mansion House conference, last week, to inaugurate a national industrial "safety first" campaign, said that in Germany £50,000,000 was saved in industry every year by attention to "safety first" appliances. The object of the new movement was to ensure that we should have throughout the United Kingdom such a condition of "safety first" as would give us the equipment for winning the industrial war after we had won the military war.

Mr. W. Hayes Fisher, President of the Local Government Board, welcomed the movement, to which he promised to give every assistance. They must use education to make people see that it was their duty to themselves, to their families, and to the State, to take every possible precaution to preserve their lives.

Mr. G. H. Roberts, Minister of Labour, said that no works should be tolerated in the country unless they were sanitary and properly lighted, and the machinery was safeguarded. Then they would be entitled to expect the workers to take every care to avoid accidents and disease. They must insist upon certain standards of equipment in the various works and factories, and in this matter he promised the support of his Department.

Mr. W. Brace, Under-Secretary for the Home Department, wished the movement every success, and assured the promoters of the co-operation of the Home Office.—*The Times.*

Industrial Councils at Birmingham.—Steps are being taken to establish Whitley Industrial Councils in relation to Birmingham municipal employés. A meeting of the Salaries, Wages, and Labour Committee was held on Tuesday, and this was attended by the chief officials of the Corporation to give their views as to the way in which such Councils might be formed. It was stated that the general question of the formation of such Councils was receiving the attention of the Association of Municipal Corporations. The Birmingham Committee came to no definite decision.

Dirt in Coal.—Sir Albert Stanley, in a written reply to Brigadier-General Page Croft, states that the Controller of Coal Mines is fully alive to the significance of the increased percentage of separable dirt in coal, and is sparing no effort to decrease it. The importance of the matter has been impressed both on miners and the management of collieries by letter, and in some cases by addressing mass meetings. An officer of special experience has been appointed to make investigations at collieries with regard to specific complaints, and to consult with both the management and the workmen regarding the steps to be taken to remedy the trouble. In so far as the percentage of separable dirt is affected by the cleaning and picking of the coal on the surface, the increase is partly due to the scarcity of labour and machinery necessary for that purpose.—*The Times.*

The Future of Gas and Electricity.—In the course of his presidential address to the Institution of Gas Engineers, on June 4th, Lord Moulton said that he was in entire agreement with the view that existing illuminating standards should be abolished, and a reasonable calorific value (preferably uniform throughout the kingdom) be put in their place as to the standard to which gas should conform. It would thus be possible to increase the amount of gas obtainable from the coal employed, and various coal-tar products need no longer be destroyed by being burnt with the gas. This introduction of a universal calorific standard for gas should take place without delay. It would put gas and its great rival, electricity, on an even footing in one important respect. Each would be paid for in proportion to the amount of energy supplied to the consumer—in the one case in the form of thermal units, in the other in the form of electrical units. They would have as their confessed object the supply of a like public want, though by wholly different means. It was, in his eyes, an industrial mistake to aim at making either displace the other. But in order that the public might reap the full benefit of the two, each must be free to do its work in the best way it could, using all the advantages it possessed, both in respect of production and consumption, unhampered by needless or harmful restrictions. The capacities of electricity for concentrated production and wide distribution had been demonstrated, and were being industrially utilised far and near. Schemes of distribution of electricity of the most ambitious and far-reaching character were now being treated as a part of practical politics. They must look forward in the near future to a strengthening and consolidation of electrical distribution so far as it could safely be effected, and in this development it would most probably receive support from public funds, and would certainly be assisted by largely-extended statutory powers. Thus favoured, electricity would be in a position to offer a fiercer competition with gas companies in the domain of public lighting. And this furnished, to his mind, a strong justification for the demand that there should at once be a revision of their statutory obligations.

Electrical Power Engineers' Association.—The first meeting of the Liverpool Branch was held on Friday last. Mr. F. E. Spencer (Birkenhead) was elected chairman, and Mr. J. Hamilton (88, Routelet Road, Stoneycroft, Liverpool), hon. branch secretary, with a Committee of five. Application forms for membership from engineers in the Liverpool district may be had from the secretary.

Fatality.—A verdict of "Accidental death" was returned at West Bromwich upon W. C. Baker (19), who died from injuries received at Oldbury Carriage Works. He was engaged in fixing electric wires to a stanchion, when he was struck by an electric crane.

Coal Rations for Industries.—It is understood that the Coal Controller contemplates rationing coal to industries as well as to householders. A Conference on the subject will be held in the next few days.—*The Times.*

"Self-Delivery" of Electric Vehicles.—Electric vehicle manufacturers in the U.S.A., confronted with freight transportation congestion, have resorted to the method of "self-delivery" (under their own power) of their cars. Many such deliveries from factories to agencies have been made, as evidenced by the following account of a standard electric passenger car, in travelling over 80 miles of snow-drifted roads. Mr. H. H. Dennis, who drove the "electric" from Toledo to Detroit, demonstrated the ability of the vehicle to negotiate roads that blocked the progress of motor trucks, and which drivers of high-powered gasoline cars would not attempt for fear of being stalled. The trip was made the day following a 6-in. fall of snow, that drifted before a high wind and blotted out the beaten track, making it very easy to get into snow banks 3 and 4 ft. deep.

Four miles out of Monroe, two Government trucks that were hauling crushed stone were met; they had got out of the road and were stalled. Mr. Dennis took the "electric" into the deep snow at the side to get past them. A little further along the way he met face to face an Army truck train en route to the coast. One of the Army trucks had turned out to let another car go by and was stalled. The officer had issued orders not to turn out again for any other vehicle. This forced the "electric" to go down in a ditch along the roadway and travel in the deep drifts there, till 19 Army trucks were passed. A few miles further on more Government trucks were met. They also were stalled, and this time the "electric" plunged through a 3-ft. drift to go by. The truck drivers cheered as the "electric" turned back into the beaten track. Near Detroit, Mr. Dennis passed between 25 and 30 new cars which he gave a wide berth, deliberately taking the side of the road and forging through the drifts.

Not once did the "electric" falter; and while the charge of the batteries was practically exhausted when the car rolled into the service station in Detroit, it made the distance without trouble. To travel 80 miles in an "electric," which has been in service some time, is a fair average trip for a single charge, even under good road conditions. With deep snow and numberless turn-outs, it stands as a very good record.

Training Disabled Soldiers.—Mr. Hodge, Minister of Pensions, replying to Mr. Anderson, in the House of Commons, said:—The number of medical cases which were receiving training in the week ended June 5th, and the number which had received training under the Ministry up to that date, were 6,526 and 7,613 respectively, or a total of 14,139. In practically every case men who have completed courses of training had been put into employment.—*The Times.*

The Engineering Trades After the War.—The complete reports of the B. of T. Committees on the engineering and iron and steel industries have now been published. We hope to refer to their contents later.

Platinum from Russia.—Many of the delicate electric instruments essential to war machinery depend upon platinum for special parts. In this connection it is interesting to learn from the *Journal of Electricity* that Russia's supply of platinum is being entirely taken over by Germany. There are only between 25,000 to 50,000 oz. of the precious metal in the United States to-day, and Nevada, California, Utah, and Oregon have turned out not more than 750 oz. a year, which geologists believe can be increased to 3,000 oz.

Radio Instruments and Measurements.—The U.S. Bureau of Standards has issued a treatise on radio measurements, which includes a development of the essential theory of high-frequency measurements from simple but precise low-frequency theory, the use of reactance curves in the rapid solution of problems, descriptions of radio instruments, and formulæ and data for radio work. The full treatment of fundamental principles will make this circular serve as a foundation for later publications which may be issued by the Bureau on the general subject of radio communication.—*Journal* of the Franklin Institute.

Institution and Lecture Notes.—Institution of Municipal Engineers.—Mr. Reginald Brown, M.Inst.C.E., engineer and surveyor, Southall-Norwood U.D.C., has been nominated as president of this Institution. The following notice of motion has been given:—

That it is desirable, in the opinion of this Institution, that municipal engineers should be represented by one strong body, and with this object in view the Institution of Municipal and County Engineers be asked to appoint three of the members of their Council to meet three members of the Council of this Institution to discuss the matter, and to report later to their respective Councils.

Appointments Vacant.—The Keighley Tramways and Electricity Committee is asking for authority to appoint an assistant electrical engineer and tramways manager, at £200; a junior shift engineer, electrical mechanic, is wanted for the Rotherham Corporation Electricity Supply; shift engineer (60s. + 12½ per cent.), junior assistant engineer (38s. + 12½ per cent.) for the Rawtenstall Electricity Department; electrical draughtsman for the Admiralty Department of Electrical Engineering; engineer-in-charge (£175) for the Darlington Corporation Electricity Works; shift engineer for the Stepney B.C. Electricity Department; meter superintendent (63s. + 12½ per cent.) for Loughborough Corporation Electricity Works. See "Official Notices" to-day.

The Periscope in a Power House.—The periscope is now being used in the deadly wilds of the power plant. In order to read the temperature of the oil in transformers in a Western plant, it has been necessary in the past to use a step-ladder to reach the thermometer mounted at the top of each unit. By using a simple periscope on each transformer, it is now possible for the attendants to read the thermometer scale from the floor.

Industrial Reconstruction Council.—This Council has issued a manifesto concerning Capital and Labour and the Government, in which it presses for the immediate acceptance of the following principle:—That any commercial or industrial matter ought not to interest the Government unless it interests both Labour and Capital. It urges the consequent adoption of the following policy:—That the Government will undertake to obtain, and, wherever possible, accept, advice on these matters from bodies equally representative of both Labour and Capital.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At the St. Pancras Borough Council generating station, King's Road, MR. W. J. LEE, A.M.I.E.E., engineer-in-charge, was presented with a service of cutlery by the staff and employés on the occasion of his marriage to Miss Edith Maud, of Leigh-on-Sea.

The proposal to rescind a resolution of the Hackney Borough Council, dated March, 1906, fixing the salary of the borough electrical engineer at £750, not having been carried, the recommendation for increasing the maximum to £1,000, already mentioned here, has been dropped.

The Stafford Council has increased the salary of MR. W. H. ROBINS, electrical engineer, by £20 per annum.

Ashton-under-Lyne Town Council has decided to increase the salary of MR. NEVILLE APPELBEE, borough electrical engineer, from £500 to £550 per year, as from October last. Ald. Coop, chairman of the Electricity Committee, pointed out that in July, 1914, the Committee passed a resolution in favour of the salary being increased by £100, but at the August meeting, on the outbreak of war, the resolution was withdrawn.

The salaries of the Bradford City electrical engineer (MR. THOMAS ROLES) and his deputy (MR. J. H. SHAW) have been increased by £100 each. By these increases the respective salaries of the two gentlemen amount to £1,000 and £550 respectively. The recommendation of the Electricity Committee was for £200, but the War Wages Committee overruled that figure, and recommended £100.

The Torquay Electricity Committee proposes to increase the salary of MR. WILLIAMS, the collector, from £150 to £180 per annum, the war bonus of 10 per cent. thus automatically ceasing.

MR. R. C. HILL, who was engineer-in-charge at the Gloucester Corporation Electricity Department, has been appointed Assistant Motor Engineer (Officer), in the Royal Fleet Auxiliary Service, Salvage Section.

General.—MR. R. W. WILLIS, A.M.I.E.E., electrical engineer on the staff of the Director of Electrical Engineering, Admiralty, has been appointed to represent the Director in Manchester in regard to work in progress in the north-west area of England.

The HON. SIR CHARLES A. PARSONS, F.R.S., &c., has consented to fill the office of President of the Polytechnic School of Engineering, Regent Street, W., in succession to the late Mr. Charles Hawksley. The first president of the school was Prof. David Hughes, F.R.S., the founder of the Hughes Medal of the Royal Society.

COLONEL J. J. CARTY, U.S. Signal Corps, and chief engineer of the American Telephone and Telegraph Co., was presented with the Edison Medal in recognition of his services in developing the science and art of telephone engineering, at the annual meeting of the American Institute of Electrical Engineers, in New York, on May 15th.

The Institution of Mining Engineers has expelled MR. ARNOLD LUPTON from its membership.

MR. E. KILBURN SCOTT, who has been in the United States for some months on business, has delivered lectures before various audiences on the manufacture of nitrates from the air. He recently addressed a meeting of the Yale Branch of the American Institute of Electrical Engineers at the Sheffield Scientific School of Yale University, and stated that the Germans, who were entirely dependent on their own resources for fixed nitrogen, must be making it for explosives and fertilisers at the rate of over a million tons a year.

MR. MALCOLM LEGGETT, F.C.I.S., has resigned his position as secretary of Pritchett & Gold and Electrical Power Storage Co., Ltd. Communications should be addressed to him, care of the Chartered Institute of Secretaries, 59A, London Wall, E.C. 2. Mr. Leggett was secretary of the Electrical Power Storage Co. for several years until its amalgamation with Pritchetts & Gold, Ltd., in 1915.

A peerage has been conferred upon SIR WM. WEIR, Secretary of State for the Air Force, who is a member of the well-known Glasgow engineering firm of G. & J. Weir, Ltd.

ALDERMAN ELLAWAY has been appointed chairman of the Birmingham Tramways Committee, in succession to Mr. Harrison Barrow, who recently resigned his public work.

MR. H. M. SCHOFIELD, of the secretarial department, County of London Electric Supply Co., has received his commission as a full flying officer in the R.A.F.

Roll of Honour.—GUNNER G. F. WILLOTT, R.G.A., of the secretarial department, County of London Electric Supply Co., Ltd., has been killed in action in France.

SERGEANT H. W. WEYMOUTH, R.F.A., formerly employed at Messrs. Siemens Bros. Dynamo Works, Stafford, has been awarded the Military Medal for gallantry and devotion to duty on May 15th.

PRIVATE ANDREW KAY, Royal Welsh Fusiliers, killed in action, was formerly employed at the British Westinghouse Co., Ltd., Trafford Park.

PRIVATE H. ALLEN, London Regt., for some years on the staff of the Croydon tramways, is a prisoner of war in Germany.

PRIVATE H. BURKE, Lincs. Regt., who is reported missing since March 21st, was engaged with Wright & Wood electrical engineers, of Halifax.

PRIVATE H. SAVILLE, K.O.Y.L.I., reported wounded, was on the staff of the Wakefield Electricity Works.

SECOND-LIEUT. A. J. CRAWFORD, Tank Corps, an apprentice at the British Westinghouse Works at Manchester, has been wounded.

SERGEANT MOODY, R.F.A., who has been awarded the D.C.M., was formerly on the staff of the Leeds Corporation's Bramley Tramway Depôt.

CORPORAL R. BARBAIR, formerly on the staff of the General Electric Co. at Glasgow, has been awarded the Military Medal.

PRIVATE J. H. HOPKINS, who was formerly a motorman on the Beanwood route of the Birmingham Corporation tramways, has been awarded the Military Medal.

LANCE-CORPORAL G. L. MUDIE, R.E., who was an electrical engineer with Messrs. Mackenzie & Co., Dundee, has won the Military Medal.

Birthday Honours.—MR. JOHN MOXON, chairman of the Newport (Mon.) Electricity and Tramways Committee, is a recipient of the O.B.E. He is a practising solicitor.

In addition to those already mentioned here as appearing in the list of Birthday Honours, we should record that the honour of Knight Commander of the Order of the British Empire has been conferred upon MR. W. MACKENZIE, K.C., who acted as an arbitrator and conciliator in the industrial disputes under the Board of Trade and the Ministry of Labour. Sir William was chairman of one of the Commissions of Inquiry into causes of industrial unrest. At the inquiry into the Manchester engineering piece rates he acted as chairman.

MR. C. A. LISTER, J.P., the chairman of the M-L. Magneto Syndicate, Ltd., of Coventry, has been gazetted a Commander of the Order of the British Empire. Mr. Lister is a director of the firm of R. A. Lister & Co., Ltd., of Dursley, Glos.

Obituary.—MR. THOMAS BODDY, a director of the Northallerton Electric Light and Power Co. from its inception, died on Saturday last, aged 72 years.

MR. E. C. GEALE.—We regret to announce the death, on the 13th inst., at 10, Clifton Road, Crouch End, N., of Mr. Edward C. Geale, of the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd. He joined the head-office staff at the end of 1881, and after serving in various capacities was appointed accountant of the company in 1903.

CITY NOTES.

South Wales Electrical Power Distribution Co.

Mr. W. G. DALZIEL, presiding at the annual meeting at Cardiff, said that the Treforest Co. made all payments and received all revenue for and on behalf of that company, and that was the reason why, so long as the present agreement remained in force, they had no revenue account to submit. The Treforest Co.'s share of revenue was limited to the 5 per cent. per annum interest, which they received on the prior lien debenture stock issued to them as security for the capital subscribed by their members from time to time for the purpose of assisting in carrying on the undertaking and providing for extensions of plant, mains, &c. Beyond this they did not participate in the revenue. The company's output showed a material increase; the units sold amounted to 36,959,049, as compared with 30,058,461 in 1916, an increase of 6,900,588, or nearly 23 per cent. The actual increase was very satisfactory from the point of view of expansion, but they had not been able to reap anything like the full benefit of this extension of business owing to the constantly increasing cost of material and stores, and the additional cost of labour under the various Government awards and decisions. In all the circumstances, they could congratulate themselves on the result of the year's working, for after payment of all working expenses, interest on prior lien debenture stock, and making due provision for depreciation of new plant, they earned the full interest, amounting to £10,000, on the original debenture stock of the company, and were able to carry forward a small balance. This was the first time in the history of the company that the whole of the interest on the original debenture stock had been earned in the 12 months during which it accrued. During the year under review, 1,660 additional H.P. had been connected to their mains, bringing the total up to 41,123 H.P., and negotiations had been completed for a further substantial increase of output. This new business included supplies to the Blaenavon Co., Ltd., for their works at Blaenavon, Messrs. Baldwins, Ltd., for their Panteg Steel Works, the Pontnewynydd Sheet & Galvanising Co., Ltd., the Crumlin Valley Collieries, the United National Collieries, Cross Keys and Nine Mile Point, and the South Wales Basic Slag Co. It was true that some of this business had come to them through the influence of the Ministry of Munitions, who had preferred that supplies should be taken from them rather than that certain works should put down their own generating plant, but in the majority of cases the business had reached them in the ordinary course. In either case it was gratifying to know that large electrical supply undertakings such as theirs were now being looked upon, not only by large users of power, but also by the Government, as an important, and, in fact, a necessary factor in the industrial life of the nation.

United River Plate Telephone Co., Ltd.

Sir J. GAVEY presided at the annual meeting on June 14th. He said that the growth of the system, which was temporarily checked on the outbreak of the war, had since then continued steadily to expand year by year until it had now almost reached its normal pre-war figure of annual increase. Although this result was in itself extremely gratifying, it had caused, and was causing, considerable anxiety to the management, both in London and Buenos Aires, owing to the extreme difficulty, and in some cases the impossibility, of obtaining supplies of plant in adequate quantities. It had only been possible to meet the increased demand for telephone service owing to the fact that considerable reserves, both in the shape of underground conductors and exchange switchboard equipment, had been provided prior to the year 1915. The only two sources of supply on which they could now draw were Great Britain and the United States, and as the needs of the war encroached more and more on the manufacturing industries of both countries, there was little prospect of much alleviation of their difficulties. If the war should be much prolonged it might be found impossible to meet all the demands for service by new subscribers for a time, but every effort was being made to avoid such a con-

tingency. The gross earnings in Argentina and London amounted to £793,670, an increase of £84,444. Maintenance and other expenses of management had increased by £50,882, resulting in a net profit increase of £33,562. During the year, without any canvassing, 13,400 new telephone stations had been connected to the system; 8,180 had been withdrawn through subscribers discontinuing the service, leaving a net increase of 5,220 (as against 3,966 during 1916), bringing the total stations at the end of the year up to 65,788. The net increase for the year was only some 1,200 below the pre-war year of 1913. They might, therefore, hope that when times were again normal a very large telephone development would arise. The automatic systems in the cities of Rosario and Cordoba were working very satisfactorily, and continued to give good service, and in the former city they had under consideration the conversion to automatic working of a sub-exchange, known as Iriondo, so that before very long the whole of the city of Rosario would have automatic telephone service. During the year they entered into negotiations with certain independent telephone companies for the acquisition of their plant. Some of these, although they served important agricultural districts, were at present isolated, and therefore were limited in their use. Incorporation or alliance with the general service provided by the company would add immensely to the utility of the telephone to the inhabitants of such districts. After referring to commercial conditions in Argentina, Sir John said that during the year one of the directors, Mr. J. E. Kingsbury, paid a long-needed visit to the other side. He had several conferences with the local committee, visited the principal exchanges, and had presented an appreciative and valuable report. Mr. Kingsbury later addressed the meeting regarding his visit.

Lancashire Power Construction Co., Ltd.

The report for the year ended March 31st, 1918, states that the trading profit of the Lancashire Electric Power Co. for 1917 amounted to £41,548, plus interest on hire purchase plants, &c., £483, making £42,031, compared with £39,839 for 1916. The balance brought forward was £7,703. Debenture interest absorbs £4,500. To reserve fund £15,000, dividend of 5 per cent. on shares £24,514, carried forward £5,721. The following figures indicate the development of the Parliamentary Co.'s business for three years:—

	1915.	1916.	1917.
Units generated	35,768,064	40,842,652	43,744,919
Maximum load in kw. ..	10,740	11,900	13,300
H.P. connected ..	29,000	30,600	34,000
Receipts	£72,295	£97,964	£115,131
Expenditure	£40,160	£59,254	£73,583
Profit on trading	£32,235	£38,710	£41,548

The Revenue of the Lancashire Power Construction Co., Ltd., shows that the total interest, dividend, and other receipts for the year ended March 31st, 1918, amounted to £29,024, and after deducting therefrom debenture interest, trustees' fees, and general charges payable, £18,455, there is left an available balance of £10,569. The directors recommend a dividend for the half-year ended March 31st, 1918, less income-tax, at the rate of 7 per cent. per annum on the preference shares, £7,507 being carried forward. The re-arrangement of the capital has been accomplished. Sir R. A. Hampson and Mr. J. L. Rushton have resigned their seats on the board.

Barcelona Traction, Light & Power Co., Ltd.—Owing to the delay and complications resulting from the continuance of the war, affecting both the delivery and the cost of machinery and other supplies, it will not be possible for the company to resume full payment in cash of the interest on its bonds on December 1st next, as was contemplated when the bondholders met in June, 1915. The committee, in consultation with the directors, are therefore formulating a plan, the basis of which will be the payment in cash of a portion of the interest, commencing with the coupon due December 1st, with compensating arrangements for deferring payment of the full interest.—*Financier.*

Trowbridge Electric Supply Co., Ltd.—At the annual meeting it was stated that the concern was working at very high pressure, and considerable repairs would be necessary after the war. The managing director (Mr. J. H. Edwards) said that the plant was never designed for continuous running, but only for about five hours a day on the average, whereas they were now running 20 or 22 hours a day throughout the year. A reserve engine was being installed. The dividend of 7½ per cent. on the ordinary shares was approved.

Waygood-Otis Co., Ltd.—After paying preference dividend for 1916 and 1917, and putting £2,000 to reserve and £2,000 to reserve for depreciation of investments, £8,403 is carried forward.

Swansea Improvements & Tramways Co., Ltd.—A dividend of 6 per cent. on the ordinary shares is to be paid (after putting £3,000 to reserve), carrying forward £2,654.

Colombo Electric Tramways & Lighting Co., Ltd.—A dividend of 10 per cent., free of tax, is to be paid for 1917, £13,500 being put to reserve, and £8,655 carried forward.

Calcutta Electric Supply Corporation, Ltd.—Units sold to consumers during the four weeks ended March 1st, 1918, 2,060,083, compared with 1,776,965 units last year. Four weeks ended March 29th, 1918, 2,440,756, compared with 1,941,311 units last year.

Pernambuco Tramways & Power Co., Ltd.—A dividend at the rate of 3½ per cent. in respect of the year ending December next on the 7 per cent. non-cum. participating preference shares is announced.

Telephone Co. of Egypt, Ltd.—Six per cent., tax free, is being paid on the preferred and deferred shares, making 10 per cent. for the year. After putting £12,797 to income-tax account, and £8,446 to excess profits duty for 1916, £111,677 is to be carried forward.

Jas. Keith & Blackman Co., Ltd.—Dividend on the ordinary shares 10 per cent., and a bonus of 5 per cent., both tax free. To reserve £9,267; carried forward £16,253.

North Melbourne Electric Tramways & Lighting Co., Ltd.—During the year ended September, 1917, the gross receipts were £39,361, as against £40,358 in the previous year. Owing chiefly to advanced cost of wages and materials the expenses increased from £28,888 to £30,429. The net revenue was £8,932, against £11,470 in the previous year.

J. G. White & Co., Ltd.—Net profit £13,362. Following the precedent of the previous year, the directors decided not to pay an interim dividend in January, and are now recommending a dividend payable on July 1st on both classes of shares at the rate of 6 per cent. per annum. The directors recommend a dividend of 6 per cent., less income-tax, on the cum. pref. shares for the year to February 28th, £9,000; and a dividend of 6 per cent., less income-tax, on the ordinary shares for the year, £3,000; carried forward, £43,041.

STOCKS AND SHARES.

Tuesday Evening.

Business is certainly beginning to revive in the Stock Exchange markets. In spite of the steady depletion of members of the House and their clients, owing to the operation of the Man-Power Bill—a depletion, of course, which is going on all over the country—speculative investment is by no means dormant. In some of the markets connected with electricity there is a decided accession of activity, and another outstanding feature of the week is the improvement that has taken place in a good many of the railway stocks.

The most prominent issue amongst the lower-priced home rails is District Ordinary. Here, the price has risen another 1½ to 17, following upon the advance which has already taken place this month. There has been a little buying from the provinces, where interest has been quickened by the expectation that fares will be put up. Metropolitans gained ½ in sympathy. Underground Electric stocks are steady, but London Electric shares have gone back to 2½. No doubt, the fact that nearly six months' dividends have accumulated in the prices of the dividend-paying varieties serves to stimulate the investment that is going on in this department.

Electrical manufacturing shares are buoyant. Edisons have risen to 3⅜ for the fully-paid, a jump of 15s., and the others are 3s. 6d. up at 41s. 6d. British Westinghouse Preference advanced to 2⅞. Rises have taken place in Cromptons, and a number of the lesser-known manufacturing shares. Siemens are one of the most active markets in the Stock Exchange at the moment, the statements made at the meeting last week having brought in a fresh rush of buyers. It is said that the block of shares which was bought from the Public Trustee, and which were held by him on alien enemy account, realised about £3 per share. They were put on the market at 4¼ to 4½, and the price has now risen to 5⅛. The shares are of the nominal value of £5 each, and are fully-paid. It may be that the rise has been sufficiently rapid.

Once more the air is thick with rumours of combinations and amalgamations. Some folks talk largely of the prospects that, at the end of the war, there will be but three manufacturing groups left, the rest having been absorbed or taken over in one way or another, and the trio is named as the British Westinghouse, General Electric, and Siemens. It is said that Vickers on the one hand, and the Metropolitan Carriage, Wagon & Finance Co., of Birmingham, on the other, are both concerned in the fusion of interests contemplated. Such reports are repeated only, of course, for what they may be worth, but they suffice to keep the market in a state of mild excitement, and are supplying the driving power which has forced up prices just lately.

Other manufacturing shares are also good. Rises in the cable group are maintained in some instances and improved upon in others, while the cable stocks and shares themselves once more show advances. In the case of some of these last-named, there is the additional attraction of the dividends being paid free of tax. In which connection, it may be mentioned that the General Electric dividend is now distributed in this way, and the yield in our column of prices is distinguished with the asterisk that marks dividends that are paid without deduction of the tax.

The electricity supply market is still overcast to some extent by the presence of deceased accounts which have not yet been entirely realised. However, substantial lines of shares have changed ownership within the last few days, and it should not be long before the market is freed from the incubus lately imposed upon it by the death of holders. The

usual supporters of this section are rendered a little chary of touching the shares owing to the restriction placed upon consumption, upon which we have already commented, but this, as already pointed out, is not likely to make a great deal of difference to the companies supplying current for power. City Lights fell ¼ and County Ordinary ½, but the list as a whole shows a somewhat surprising degree of strength in view of the considerations that militate against the market for the time being.

Foreign investments are noteworthy from a recovery that has occurred in a good many of the Mexican stocks. President Wilson, in a recent interview to Mexican journalists, took a statesmanlike view of the situation so far as Mexico is concerned, and spoke of the future with hope and cheerfulness. This had a good effect on Mexican Government and railway bonds, though up to the present the market in Utilities has scarcely responded. The position is, however, that instead of shares being readily purchaseable, the previous sellers are now holding out for higher prices. Brazilian Tractions continue to be a weak market, and Anglo-Argentine Tramways remain under the depressing influence of the passing of the dividend on the first preference shares.

The iron and steel group is strong throughout. So many companies connected with the industry have lately declared a bonus in one manner or another, that buying is active, not only in London, but from South Wales, the Midlands, and further North. The rubber share market continues to be somewhat heavy, and amongst the base-metal mining shares, those connected with tin continue to attract a little attention. Victoria Falls Power shares are not much affected by the labour unrest that has arisen in the Transvaal, the prices of the Ordinary and Preference being 16s. 9d. and 23s. respectively.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price June 18, 1918.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	9	10	6¼	—	£7 13 10
Charing Cross Ordinary	5	4	3½	—	6 3 1
do. do. do. 4½ Pref.	4½	4½	3⅞	—	6 18 6
Chelsea	3	5	3	—	8 6 8
City of London	8	8	11½	— ¼	7 2 3
do. do. 6 per cent. Pref.	6	6	9⅞	—	6 0 4
County of London	7	7	10¾	— ½	6 15 0
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	6	7	5½	—	6 13 4
London Electric	Nil	Nil	1¼	—	Nil
do. do. 6 per cent. Pref.	4	5	3½	—	7 13 10
Metropolitan	3	4	3⅝	—	6 8 0
do. 4½ per cent. Pref.	4½	4½	3½	—	6 13 4
St. James' and Pall Mall	8	9	6¾	—	6 11 0
South London	5	5	2½	—	7 2 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6½	—	7 3 10
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	94½	+ ½	6 7 0
do. Def.	1½	1½	22	—	6 14 10
Chile Telephone	8	—	8½	—	4 17 0
Cuba Sub. Ord.	7	7	9½	—	*7 8 7
Eastern Extension	8	8	15½	—	5 1 7
Eastern Tel. Ord.	8	8	159½	+1	*5 0 4
Globe Tel. and T. Ord.	7	—	15	—	*4 13 4
do. do. Pref.	6	6	10	—	6 0 0
Great Northern Tel.	24	22	38	—	5 15 9
Indo-European	13	—	49½	—	6 5 1
Marconi	15	—	3⅝	—	4 17 10
Oriental Telephone Ord.	10	—	4¾	+ 1/8	2 5 9
United R. Plate Tel.	8	8	7⅞	+ ⅛	*5 7 7
West India and Panama	6d.	9d.	1⅛	—	*3 6 8
Western Telegraph	8	8	15¾	+ ¼	*5 0 10
Home Rails.					
Central London Ord. Assented	4	4	62½	—	6 8 0
Metropolitan	1	1	21½	+ ½	4 14 1
do. District	Nil	Nil	17	+1½	Nil
Underground Electric Ordinary	Nil	Nil	1⅞	—	Nil
do. do. "A"	Nil	Nil	5/-	—	Nil
do. do. Income	6	4	76½	—	*5 4 7
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4⅞	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	3	—	—
do. do. 2nd Pref.	5½	—	2½	—	—
do. do. 5 Deb.	5	5	68	—	7 18 10
Brazil Tractions	—	—	41	—1	—
Bombay Electric Pref.	6	6	9½	—	6 6 4
British Columbia Elec. Rly. Pfce.	5	5	61½	—	8 2 8
do. do. Preferred	Nil	Nil	43½	—	Nil
do. do. Deferred	Nil	Nil	35	—	Nil
do. do. Deb.	4½	4½	63	—	6 15 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	37½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	30	—	Nil
Mexican Light Common	Nil	Nil	20	—	Nil
do. Pref.	Nil	Nil	26½	—	Nil
do. 1st Bonds	Nil	Nil	37½	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3⅝	—	4 9 0
British Aluminium Ord.	10	10	11½	—	5 18 6
British Insulated Ord.	20	20	3⅛	—	5 6 8
British Westinghouse Pref.	7½	7½	2⅝	+ ⅛	6 6 4
Callenders	20	—	17½	—	5 16 0
do. 5 Pref.	5	5	4xd	+ ½	6 5 0
Castner-Kellner	22	20	3⅞	—	6 0 10
Edison-Swan, fully paid	—	—	3⅜	+ ⅜	Nil
do. do. 4 per cent. Deb.	4	4	75½	—	5 6 0
Electric Construction	7½	10	1½xd	—	8 0 0
Gen. Elec. Pref.	6	6	10½	—	5 15 8
do. Ord.	10	10	22	+ ½	*4 11 0
Henley	25	25	21	—	5 19 1
do. 4½ Pref.	4½	4½	3⅞	—	5 12 2
India-Rubber	10	10	16½	—	*6 3 1
Telegraph Con.	20	20	42½	—	*5 13 0

*Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, June 19th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£80	..
a Ammonia, Muriate (large crystal)	"	£75	..
a Bisulphide of Carbon	"	..	..
a Borax	"	£48	..
a Copper Sulphate	"	£87 10/-	..
a Potash, Chlorate	per lb.	2/6	..
a " Perchlorate	"	2/-	..
a Shellac	per cwt.	£16 15/-	..
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£35	..
a " Lump	"	£26	..
a Soda, Chlorate	per lb.	1/1	..
a " Crystals	per ton	170/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1/7 to 1/7½	..
g " Bars (best selected)	per ton	£147	..
g " Sheet	"	£147	..
g " Rod	"	£147	..
d " (Electrolytic) Bars	"	£135	..
d " " Sheets	"	£152	..
d " " Wire Rods	"	£138	..
d " " H.C. Wire	per lb.	1/4	..
f Ebonite Rod	"	5/-	..
f " Sheet	"	2/6	..
n German Silver Wire	"	2/6	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	3/1	..
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£37	£5 dec.
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e " " " medium	"	8/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/6½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	4/6	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

British Electric Traction Co., Ltd.—Gross profit for the year ended March, 1918, £237,906, against £226,745. After deducting general expenses and the amount written off sundry assets £28,685, £209,221 remains, plus £97,598 brought forward. Debenture interest requires £90,978; there is put to reserve £21,172; 6 per cent. on the cum. pref. stock, £42,765; 5 per cent. on the ordinary stock, £39,788; carried forward, £112,116. The net profit shows an increase of £9,249.

The aggregate receipts of the associated companies show an advance, but the wages paid and the cost of materials have also increased, and larger provisions have been made for future repairs and maintenance. In the Metropolitan area war conditions generally have had a prejudicial effect. The question of increasing the statutory fares on tramways and light railways is now under the consideration of a Select Committee of the House of Commons. The reserve will now stand at £450,000. The investments stand at £4,262,958, and yielded a revenue of £210,361, representing an average of 4.93 per cent. for the year on the amount at which they appear in the balance sheet, as compared with 4.79 per cent. for the preceding year.

Oriental Telephone & Electric Co., Ltd.—Dividend at the rate of 6 per cent. per annum on the preference shares for the half-year ended December 31st last, less income-tax, and a final dividend of 6 per cent. on the ordinary shares, free of income-tax, making a total of 10 per cent. for the year, and a bonus on the ordinary shares of 1s. per share, free of income-tax.

Aluminium Corporation, Ltd.—The trading accounts for 1917 cannot yet be submitted, but the payment of a year's dividend on the 7 per cent. preference stock and shares is recommended.

Fellows Magneto Co., Ltd.—At the first annual meeting, last week, Mr. V. L. Fellows said that the recommendations of the Lord Balfour Committee respecting protection for British magneto manufacturing must have an important bearing on the prospects of their company. Their business had rapidly developed, and they were now negotiating for a further increase of their factory. The type of magneto was of a much higher standard of quality than any pre-war Bosch design. For the new factory extensions they would require an additional £40,000. In replying to questions, Mr. Fellows said that the machines used at the present time were hardly dreamt of in 1916. The type of magneto of that date was soon obsolete. It was highly necessary for the company to make arrangements for dealing with the trade that would be done after the war.

NEW ELECTRIC PASSENGER LOCOMOTIVES.

THE Westinghouse Electric & Manufacturing Co. and the Baldwin Locomotive Works have under construction for passenger service on the Chicago, Milwaukee and St. Paul Railway 10 direct-current, regenerating locomotives, which form part of the electrification extension.

The complete locomotive, with a total length over couplings of 90 ft., weighs ready for service 266 tons, and has an adhesion weight of 330,000 lb. The single cab is carried on the two main running gears, each having a four-wheel guiding truck, three driving axles in a 16 ft. 9 in. rigid wheel base, and a two-wheel trailing truck.

The main running gear centre pins are located midway between the first and second driving axles of each running gear. On one running gear the centre pin is designed to restrain the cab both longitudinally and laterally, while on the other the centre pin restrains the cab only laterally, permitting free longitudinal movement. This arrangement of riding and floating pins relieves the cab of pulling and buffing strains due to train load, as these strains are taken directly through the running gear side frames and bumpers. The driving wheels are 68 in. in diameter, and carry 55,000 lb. per axle. The guiding trucks have 36-in. wheels, while each two-wheel truck has a load of 38,500 lb. at the rail, with approximately 62,000 lb. distributed on each of the four-wheel trucks.

On any single driving wheel, the non-spring supported weight is that of wheels, axles, and driving boxes only.

The flexible type of quill drive is used to afford a means of permitting a motor located well above the road bed to drive an axle which, with its wheels, is free to follow the rail independently. This drive secures all the advantages of a flexible gear in cushioning the transmission of torque, and minimises the road shock.

Each main running gear has three-point equalisation, with a single point towards the end of the locomotive. The four-wheel guiding truck centre pin and cross-equalised leading pair of driving wheels are equalised together on the longitudinal centre line of the locomotive. The remaining two pairs of driving wheels and the two trailing wheels of the main running gear are side-equalised together again. The method of equalisation used here provides a weight variation on the driving wheels of only 6 per cent. from normal when the locomotive is pulling at 30 per cent. adhesion.

The centre of gravity of the main running gear, including motors, is 41¼ in. above the rail, and the height of the centre of gravity of the complete locomotive is 63 in. above the rail.

One of these locomotive units is capable of hauling a 950-ton train (12 coaches) over the entire mountain section at the same speeds as called for by the present schedules. The one-hour rating is 4,000 H.P., and the continuous rating is 3,200 H.P., with a starting tractive effort of 112,000 lb. The normal speed on level track is 60 M.P.H., and on a 2 per cent. grade a speed of about 25 M.P.H. is maintained.

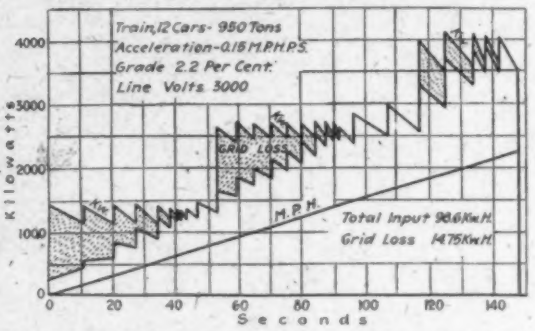


FIG. 3.—TYPICAL STARTING CURRENT GRAPH, ST. PAUL QUILL-DRIVE LOCOMOTIVE.

Flexibility of speed control is obtained by the use of nine running positions without rheostatic loss. The six 1,500-volt twin motors on one unit are connected for three-speed combinations as follows:—One set of six motors in series, two sets of three motors each in series, and three sets of two motors each in series.

Two additional running speeds are obtained on each speed combination by means of inductive shunts on the main motor fields, which assist in cutting down current peaks, as well as saving rheostatic losses. The speed range is from 8 to 56 M.P.H., depending on the road.

The use of the twin-motor design with quill drive permits effective use of the space between the driving wheels, and the use of two armatures, each wound for 750 volts direct current, geared to the same quill. This voltage is preferred to 1,500 on account of the better commutating characteristics inherent in motors built for the lower voltage.

The only high-voltage apparatus among the auxiliaries on the locomotive is the motor of the small motor-generator which is used for train lighting and charging the storage battery. Low-voltage auxiliaries were adopted to secure minimum complication of installation, maintenance, and operation. Ordinary inspection can be carried on, including the functioning of switches and auxiliaries, with no 3,000-volt power on the locomotive.

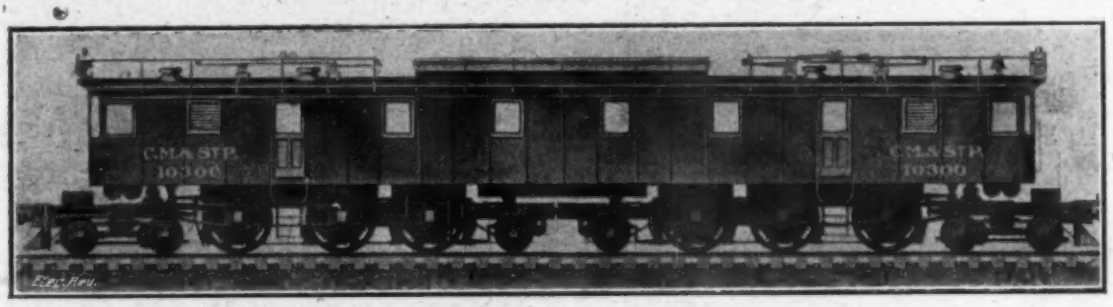


FIG. 1.—NEW LOCOMOTIVE FOR PASSENGER SERVICE ON CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

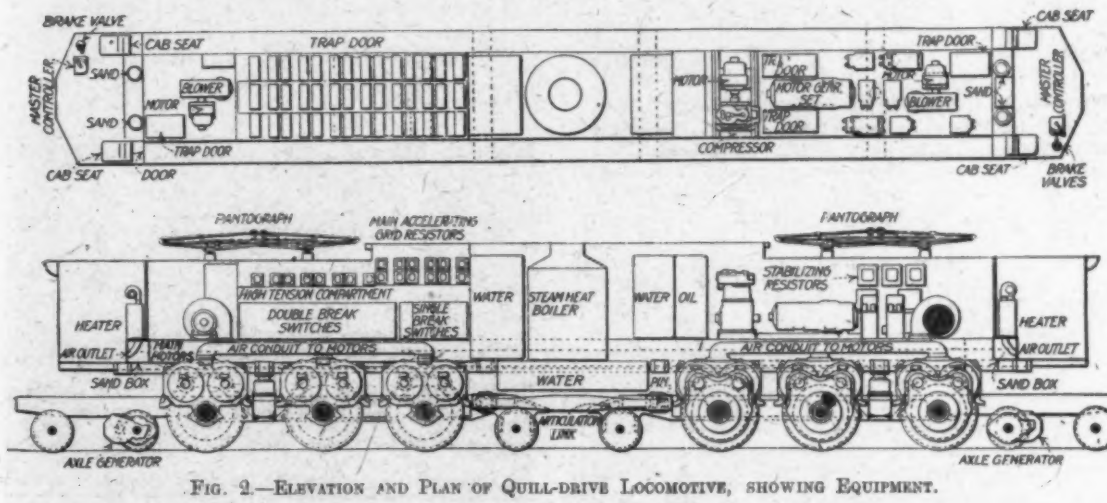


FIG. 2.—ELEVATION AND PLAN OF QUILL-DRIVE LOCOMOTIVE, SHOWING EQUIPMENT.

The regenerative control of these locomotives has been designed to secure positive operation of this feature over widely varying speeds. The same main motor combinations for "motoring" are used for "regenerating," except that the fields of the main motors are separately excited over a wide range by means of axle-driven generators. These are so connected with balancing resistance as to ensure inherent stability in the motor characteristics during regeneration.

These machines are mounted on the pony trucks of the locomotive and, in addition to exciting the motors during regeneration, furnish power for operating the air compressors and blower motors when the locomotive is hauling. This arrangement ensures a supply of current to the air compressor motors irrespective of the overhead trolley supply, and provides that compressed air will always be available for the use of the air brakes.

Each locomotive is equipped with an oil-fired steam boiler, designed to burn the ordinary fuel oil used by the railway company. Provision is made for a storage of 7,500 gal. of water and 750 gal. of oil in each engine.

(To be concluded.)

AN AUTOMATIC HYDROELECTRIC PLANT.*

BY J. M. DRABELLE AND L. B. BONNETT.

ON October 2nd, 1917, there was placed in operation at Cedar Rapids, Iowa, the automatic hydroelectric plant of the Iowa Railway & Light Co. The station operates with no attendant, and the different generating units start or stop, depending on the flow of the river, or can be started and kept running by remote control from the main steam station. The an exterior view is shown in fig. 1. There are installed three 500-K.V.A. 80 per cent. power factor, 60-cycle, two-building is 112 ft. 34) m.) long, and 41 ft. (12.5 m.) wide; phase, 2,300-volt, 60-R.P.M. generators, of the vertical type. They are driven by waterwheels rated at 540 B.H.P., 60 R.P.M., under a 10 ft. (3 m.) head, the operating head varying from 8 ft. (2.4 m.) to 11 ft. (3.3 m.). The runners are of the

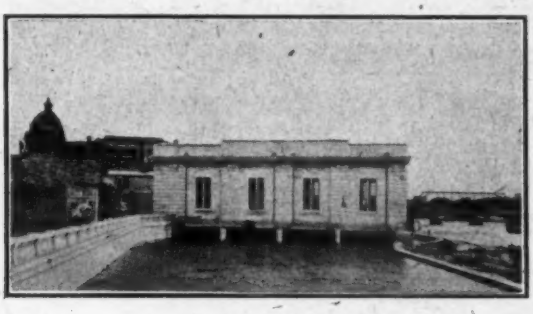


FIG. 1.—EXTERIOR OF STATION—REAR VIEW.

Francis type, having a diameter of 171 in. (4.33 m.). The rotating element is supported by a thrust bearing at the top, supplied with oil by a pump driven from the generator shaft. The dame consists of nine spillway sections, each 60 ft. (18 m.) long, with automatic flashboards, the total overall length being 600 ft. (183 m.).

There are two General Electric induction motor-driven exciter sets rated at 100 KW., 125 volts, each capable of carrying the entire excitation of the total development, namely, that of four generators. The motors are rated at 150 H.P., 2,300 volts, two-phase, 60 cycles, 1,200 R.P.M., and are designed to be started by the application of full voltage at standstill. The plant is designed to operate in parallel with the 19,000-KW. steam turbo-generating station of the Iowa Railway & Light Co., the steam plant being located at a distance of 3,300 ft. (1,006 m.) from the hydroelectric plant. The stations are tied together by one underground line consisting of two 600,000-C.M., two-conductor, concentric, 7,500-volt, varnished cambric, lead-covered cables.

The different generating units may be started and stopped either automatically, depending on the rise or fall of the water level in the river, or by remote control from the steam station when the plant is needed. To accomplish the latter, a bench board section, shown in fig. 3, was installed in the steam plant. On this, for each generator, there are provided three single-throw and one double-throw control buttons. The same benchboard contains for each generator an indicating ammeter and wattmeter, there being no instruments in the hydroelectric plant. The leads are wired through calibrating terminals at the hydroelectric plant, so that portable meters can be wired in if desired at any time.

* *Proceedings*, A.I.E.E., Vol. 37, No. 5.

The lower row of instruments on the benchboard is a totalising equipment, reading the total incoming power from the hydroelectric plant.

The waterwheel gates are not supplied with the usual hydraulic governor; but instead the opening and closing of the gates is obtained by a 5-H.P. induction motor through suitable reduction gearing. Each gate mechanism is equipped with a contact-making device operating indicating lamps on the benchboard at the Sixth Street station, showing the exact amount of gate opening. The correct sequence of operations in the control of each generator is obtained by properly

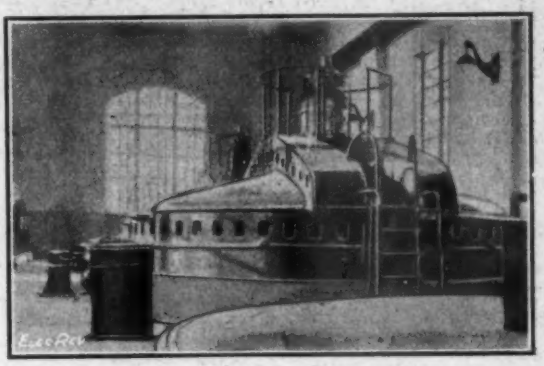


FIG. 2.—INTERIOR OF STATION.

placed segments on the drum of a controller, which is driven by a single-phase 1-H.P. repulsion-type motor. This controller definitely determines the proper time spacing between the different steps of starting the unit and connecting its generator to the bus.

For controlling the exciter sets, two oil-immersed contactors are used, also a double-throw, triple-pole switch, which connects either one or the other of the exciters to the exciter bus. A small induction motor which carries a centrifugal device on the end of the shaft is provided, which in case the frequency of the system rises to 64 cycles will open, and shut down the plant, thereby preventing runaway.

The units have individual float switches set for slightly different levels. If the water rises to a certain level it closes the float switch of the first unit, and that machine is started and put into service. If the flow of the river is such that the water continues to rise the second float switch closes, starting the second machine. The third switch is set still higher. The machines are shut down in the reverse order as the water level falls. In general the sequence of operation of each generator is as follows:—The closing of the float switch or the proper remote-control button in the steam station starts the exciter set (provided it has not already been started with another generator), and opens the waterwheel gate. When

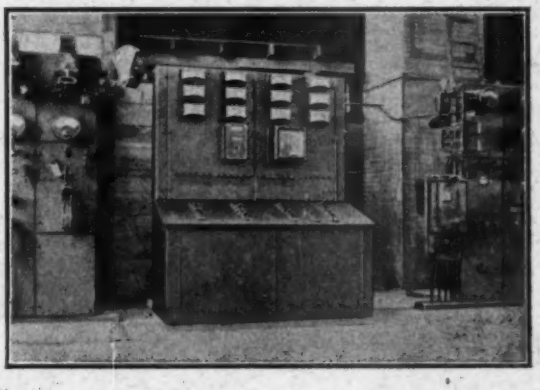


FIG. 3.—CONTROL BOARD AT STEAM STATION.

the generator comes up nearly to synchronous speed it is connected to the bus without field, but in series with a 20 per cent. reactance. A weak field is then applied, pulling the machine into synchronism. The field is then strengthened to full field, the reactance short-circuited, and the water wheel gates opened to carry full load on the unit. The generators operate with a fixed excitation adjusted for normal full-load value. If the water level is so low that with full gate opening normal load cannot be obtained, the generator, due to its high excitation, takes care of part of the wattless kilovolt-amperes of the system. The speed and voltage are determined by the steam turbine generators.

The detailed operation of this automatic equipment is fully described by the authors, who, by the aid of a wiring dia-

gram, go over the various operations in rotation which are carried out when a generator is run up and put on load.

Each controller has a relay, so that the exciter can be started from any controller; that is, any generator can be started first, and its controller starts the exciter. The steam station is equipped with control buttons so that, if desired,

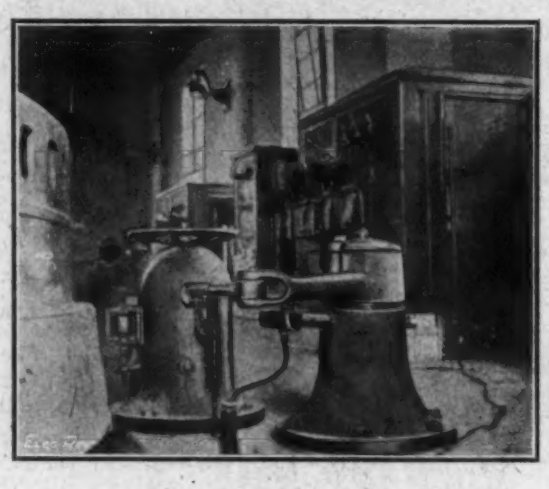


Fig. 4.—Gate Control.

the gate opening, and therefore the load on the hydroelectric generators, can be controlled from that place. The ammeter control is cut out by opening button No. 1.

A considerable number of tests were taken to determine what would happen in the automatic equipment in case of incorrect operation of the control buttons, or failure of some parts to operate correctly.

First, one of the No. 1 control buttons was opened and the load on the generator controlled by hand. It was found impossible to overload the generator, even with the gate opening to the full amount allowed by its limit switch. Button No. 1 was then closed, putting the ammeter again in control, and at the same time the operator tried to control the load from the gate control buttons. It was found that he could increase or decrease the load as desired; but when the hand-control button was released the ammeter returned the load to the proper amount determined by its setting. Buttons Nos. 2 and 3 were opened and immediately reclosed. The opening of these buttons tripped out all contactors and started the gate motor closing. The reclosing of the buttons caused the controller to go through the usual sequence of starting. This proved that if the operator accidentally opened one of these buttons and immediately closed it again, the generator would not be thrown immediately back on the bus, but would go through its proper sequence of operations.

In the steam station there is a voltmeter connected on the hydroelectric side of the oil switch. This oil switch was next tripped, and it was found that the voltage dropped to zero in about two seconds, indicating that in this time the contactors in the hydroelectric plant had all tripped out, thus clearing the generators from the bus. Upon tripping of this oil switch the generators lost their load and tended to run away. Within the two seconds mentioned the speed-limit device trips a relay, and all contactors drop out. The automatic throw-over control switch connected the separate source of power to the control bus, the dropping out of the contactors closed the water wheel gates, and the speed of the machines rose to not more than 20 to 25 per cent. above normal. The action of the gate is quite rapid, and the inertia of the machines is such that the gates closed before the wheels had time to accelerate seriously. With the generator running under load the exciter set was shut down. The armature current of the generator immediately increased and the contact-making ammeter started to close the gate. The contactors connecting the generator to the bus dropped out, due to the tripping of the direct-current, low-voltage relay, which dropped because of the failure of the exciter voltage. The generator, after loss of field, broke from synchronism and tended to run above speed, but the contact-making ammeter had already closed the gate far enough to prevent serious overspeed, and the drop out of the contactors completed the closing.

Since the hydroelectric plant has been put into regular operation, the exciter in the main steam generating station failed one day. The load on the system was much greater than the hydroelectric plant could carry by itself, so that this plant should shut itself down and clear from the steam plant. As soon as the exciter voltage in the steam station began to drop, the current of the hydroelectric generators rapidly rose, and the contact-making ammeters started the closing of the waterwheel gates. Before the voltage dropped too low the ammeters had almost completed the closing of the gates. All contactors dropped out because of low voltage, disconnecting the generators from the bus. The hydroelectric plant was ready to start again upon return of voltage on the tie cable between the two plants.

Although the generators are slow speed and have considerable inertia, only 39 seconds are required from beginning the opening of the gate until the generator is connected to the bus, with the reactance short-circuited. Within 45 seconds the generator is carrying full load. In spite of the speed with which these generators are connected to the bus, there is no serious mechanical jar perceptible.

Since the plant has been in operation no troubles, other than the small ones which always go with any new development, have been experienced, and these have all been of a very minor nature. The plant has successfully withstood short circuits, exciter failures in the steam plant, low and high water, and all of the tests that those in charge of the work could conceive of, wrong operations being brought about artificially. It has also been operated by the regular operating force at the steam plant, and there has been no occasion to keep men in the hydroelectric plant to watch its operation.

The station has been in operation about seven months. During that time, the total flow of the river has been used at all times, and a toll of approximately 3,000,000 kw.-hr. has been fed into the system.

The automatic development means that it will now be possible to develop a large number of small low-head plants and tie them in on a high-tension system, leaving their operation entirely to the float switch and voltage relays. If there is voltage on all three phases of the high-tension line and water for the turbines, they will start up and go on the line without wrecking themselves or disturbing the operation of the rest of the system.

With the elimination of the excessive labour cost of operation of a small plant, many water-power sites are capable of development as a paying investment.

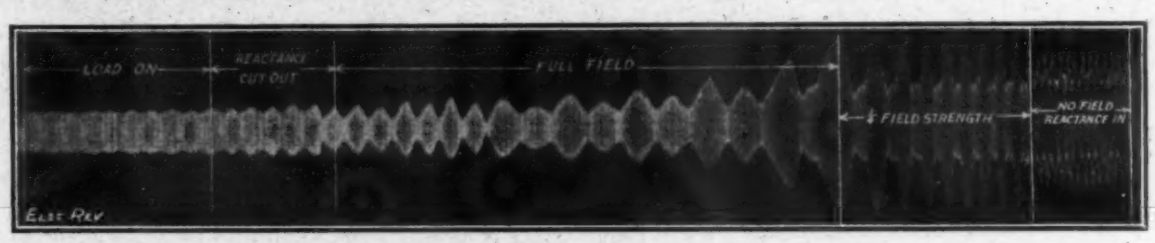


Fig. 5.—Oscillogram of Generator Current during Starting Period.

Taking Proper Care of Reactors.—As alternating-current stations grow bigger, the importance of reactors to serve as protection against short-circuits becomes greater. The average engineer has a very meagre idea of the tremendous forces exerted by reactors when big currents arising from a short-circuit occur. The installation of reactors transfers the major part of the troubles from the generator to the reactor, hence in the design and installation of these much care has proved to be necessary.

M. E. Skinner's paper on this subject in the *Electrical World*, of May 4th, throws a vivid light on the electrodynamic problems of reactor installation. The reactors in practical use are always without iron cores. They are akin to the primary circuit of a coreless transformer adapted to carry very great currents, and usually take the form of coils of bare wire with the turns supported on fireproof and non-magnetic material. They are too big to immerse conveniently in oil tanks, so reliance is placed on air as a dielectric. The temperatures reached under short-circuit conditions may be very high. Ordinary insulating materials would be of little service even if one attempted to employ them.

Particular pains must be taken to keep the reactor coil away from closed metallic circuits of every kind, to prevent loss of energy, and even possible overheating, so that in installing reactors it is necessary to pay close attention to the surroundings.

Manchester Tramways. — It is expected that the further revision of the fares and stages on the Corporation tramways will be submitted early next month. The basis of the new scale, will be 1d. for the first two miles from the centre of the city.

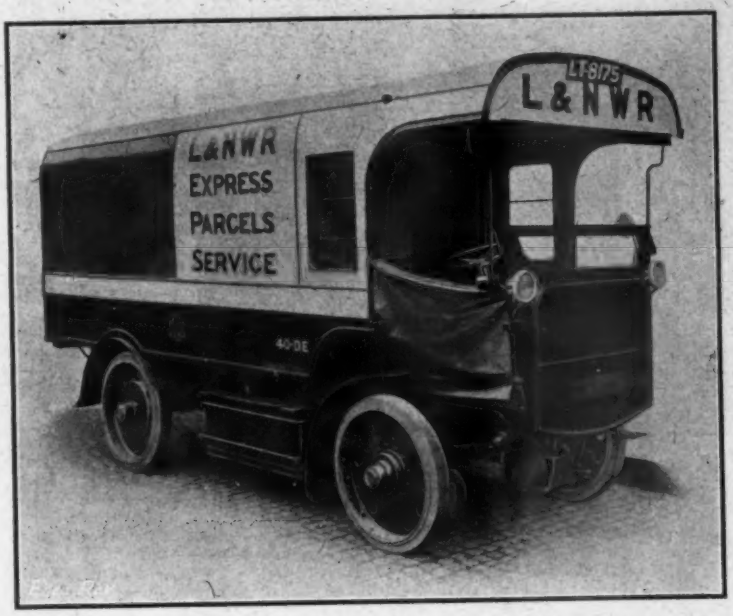
A NEW ELECTRIC PARCEL VAN.

There has recently been introduced in the London parcel service of the London & North-Western Railway a new electrically propelled van, of which, by the courtesy of Mr. W. A. Ree, outdoor goods manager at Euston, we are enabled to reproduce an illustration. The van, which presents a businesslike and neat appearance, is being tested on various routes in London, and is, we understand, doing good work in the collection and delivery of parcels handled by the roalway company.

Messrs. Ransomes, Sims & Jefferies, Ltd., Orwell Works, Ipswich, are the makers of the chassis, which is adapted for 50 cwt., and known as their "Orwell" electric chassis. The electric equipment consists of two compound motors, each individually capable of transmitting from 2½ to 7 B.H.P., according to actual load and speed. It is equipped with series-parallel control, the detailed mechanism of which has been worked out with great thought and care. The chassis is fitted with the standard charging plug approved by the Electric Vehicle Committee, and is so interlocked with the control that the latter must be in the off position during the charging of the battery. The frame consists of pressed steel girders supported on springs over each axle; all bolts and springs are enclosed in brass bushes and fitted with lubricators. Two independent mechanical brakes of the internal expanding type are provided, both of which act on the back wheels.

The Chloride Electrical Storage Co., Ltd., of Clifton Junction, Manchester, supplied the battery equipment, which consists of 40 cells of I.M.V.7 "Ironclad-Exide" type with a capacity of 226 ampere-hours at the five-hour rate. Several distinctive features are included in the design of the battery, and its ability to stand heavy boosting charges has been proved in use, while it can be discharged at any rates that the other current-carrying parts of the vehicle will accommodate. There is no difficulty in obtaining its listed capacity, as it is conservatively rated.

The body of the vehicle was constructed at the Wolverton Carriage Works of the railway company. The workmanship and finish of the whole van is excellent.



New 50-cwt. Electric Parcel Van.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C 1.

9,104. "Electric motors." H. A. Whiteside. June 3rd.

9,115. "Conversion of electric currents." C. N. Bennett & Lyon and Wrench. June 3rd.

9,149. "Battery charging apparatus." Igranic Co. (Cutler-Hammer Manufacturing Co., U.S.A.) June 3rd.

9,226. "Electrodes for electric smelting, &c." S. C. Hazard & H. S. Morris. June 4th.

9,241. "Self-excited alternators." E. C. Diem. June 4th. (France, November 22nd, 1915.)

9,249. "Electric furnaces." D. Pitt. June 5th.

9,282. "Ignition systems for internal-combustion engines." A. H. Midgley and C. A. Vandervell & Co. June 5th.

9,322. "Electrical connectors." C. G. Bennett & H. Garde. June 6th.

9,323. "Electrical insulating bushings." British Westinghouse Electric and Manufacturing Co. June 6th. (U.S.A., June 8th, 1917.)

9,324. "Sparking plugs for internal-combustion engines." H. V. J. Jouffret. June 6th. (France, December 29th, 1917.)

9,328. "Lock for carbon electrodes." W. Marr. June 6th.

9,330. "Electric relays." Fuller Accumulator Co. & A. P. Welch. June 6th.

9,331. "Electric booster relays." Fuller Accumulator Co. & A. P. Welch. June 6th.

9,345. "Dynamo-electric machines." British Thomson-Houston Co. and J. Martin. June 6th.

9,346. "Vacuum electric discharge devices." British Thomson-Houston Co., H. W. Edmundson & W. T. Munn. June 6th.

9,360. "Automatic telephone exchange." P. McEvoy. June 7th.

9,363. "Electric horns for motor cars, &c." H. Hammett. June 7th.

9,398. "Sparking plug for ignition." A. E. Heath. June 7th.

9,399. "Appliance for connection of electric conducting wires to sparking plugs, magnetos, batteries, &c." A. E. Heath. June 7th.

9,409. "Electric connections." C. Hellyar & T. H. Hellyar. June 7th.

9,419. "Electric switches." C. L. Breeden & H. Lucas. June 7th.

9,430. "Electric installation systems." Atelier H. Cuenod Soc. Anon. June 7th. (Switzerland, June 21st, 1917.)

9,454. "Electric safety lamps." Fuller Accumulator Co. & A. P. Welch. June 8th.

9,461. "Sparking plug attachment for internal-combustion engines." P. G. Harriott. June 8th.

9,469. "Electrically-heated crucibles, melting pots, &c." Morgan Crucible Co. & C. W. Speirs. June 8th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

3,585. Galvanic Cells. R. Schuster. March 12th, 1917. (115,653.)

4,882. Method of or/and Means for Individual Electric Driving of Machine Tools, such as Lathes, Drilling, or Milling Machines. H. Scholey. April 4th, 1917. (115,655.)

6,867. Electrically-operated Diaphragm Horns. E. C. R. Marks (Sparks-Withington Co.). May 14th, 1917. (115,679.)

6,870. Couplings or Connections for Electric Cables, particularly intended for use on Railway Vehicles. J. Stone & Co. (M. Walton). May 14th, 1917. (115,680.)

6,871 Brush and Terminal Contact Mechanism of Dynamo-electric Machines. J. Stone & Co. and A. H. Darker. May 14th, 1917. (115,681.)

6,889. Method of Installing and Disposition of Electrical Equipment for Motor Road Vehicles. T. L. R. d'Orville. May 14th, 1917. (115,682.)

6,936. Loading Coils for Telephone Circuits. British Insulated & Helsby Cables, Ltd., G. E. Bairsto & H. H. Harrison. May 15th, 1917. (115,685.)

7,206. Ionic Electric Relays, Amplifiers, or Detectors. S. G. Brown. May 18th, 1917. (115,700.)

7,519. Means for Preventing the Oxidation or Wasting of the Electrodes in Electric Furnaces. W. B. Hamilton & J. Holland. May 23th, 1917. (115,705.)

7,618. Means for Controlling Internal-combustion Engines. P. Hooker, Ltd., & H. Pollard. May 28th, 1917. (115,707.)

7,627. Telegraph Relays. E. C. R. Marks (United Telegraph & Cable Co., U.S.A.). May 26th, 1917. (115,708.)

8,478. Electric Furnaces. O. Sahlin. June 13th, 1917. (115,719.)

8,621. Electrical Switches. W. Ellerd-Styles. June 15th, 1917. (115,721.)

8,622. Dynamo-electric Apparatus for Motor Vehicles. H. Lucas, C. L. Breeden & H. E. Moore. June 15th, 1917. (115,722.)

9,216. Vaporising and Igniting Means for Internal-combustion Engines. A. Bellville. June 27th, 1917. (Addition to 5,464/17.) (115,727.)

11,990. Means for the Desired Distribution of Load and Current on Direct-current Units Connected in Parallel. Akt. Ges. Brown, Boveri et Cie. August 21st, 1916. (109,799.)

12,460. Selector Systems for Telegraph Typewriters. A. E. Alexander (Kleinschmidt Electric Co., U.S.A.). August 30th, 1917. (115,757.)

13,332. Electrical Limit Switches. Allmanna Svenska Elektriska Aktiebolaget & E. H. Lindblom. September 17th, 1917. (115,761.)

18,935. Magnetic Blow-out Fuses. Switchgear & Cowans and G. H. Neep. December 21st, 1917. (115,779.)

1918.

1,048. Control of Dynamo-electric Machinery. J. C. Wilson. January 18th, 1918. (115,780.)

1,172. Transmitting Keys for use in Electric Telegraphy. Marconi's Wireless Telegraph Co. & V. A. Smart. January 21st, 1918. (115,787.)

4,352. Electric Relays. D. A. Christian. March 20th, 1918. (115,796.)